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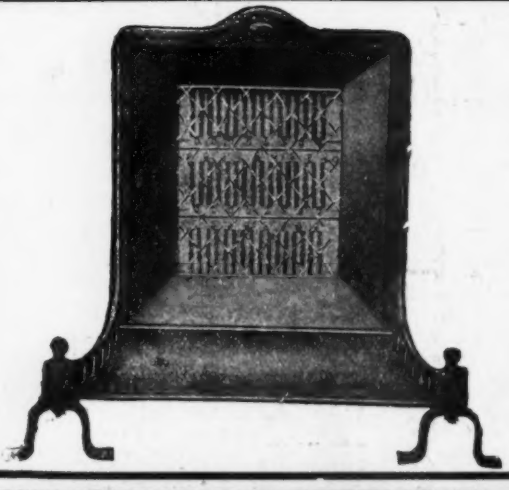

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THE ELECTRIC LAMP REPORT.

THE Report to the Standing Committee on Trusts regarding the manufacture of electric lamps, of which we commence a reprint in this issue, is a remarkable document, and contains much information of great interest to the electrical industry. Although the members of the Sub-Committee which carried out the inquiry are practically unknown in electrical circles, they appear to have acquired a thorough grasp of the subject, and while the Report is not free from mistakes, it is on the whole a very able, impartial, and judicial pronouncement.

The word "Trust" in the sense of a commercial alliance has somewhat unsavoury associations, and is often used by the Press—especially that section of it which has a Socialistic complexion—as a term of reproach or abuse. "Call a dog by a bad name—and hang him." Its evil reputation comes from the other side of the Atlantic, where Trusts of undoubtedly shady character have flourished in the past, battening on the vitals of the public, so that at last even the United States Government has been compelled to bring them under State control; but not all Trusts are malevolent and harmful to the public welfare, and we should not allow our minds to be swayed or our judgment distorted by the suggestion conveyed in the name of the Committee.

Let us then examine the Report and the conclusions of the Sub-Committee with an open and unprejudiced mind. First, it is interesting to note that the word "trust" is not used, the alternative expression in the terms of reference "trade combination" being employed. The power imputed to this body as regards 90 to 95 per cent. of the lamp industry will not be disputed; neither will it be denied that the operations of the Association have maintained prices to the public at a higher level than would have resulted from unrestrained competition. It is alleged that the trading discounts granted to distributors are unduly high, and that the prices of the lamps could be reduced by one-third while leaving the makers and dealers a satisfactory profit. The charge is made that lamps bought in Holland, which could have been sold here at 8s. each with a substantial profit, were sold to the public at 12s. 6d., the lamp trade thus netting £280,000 in excess of a reasonable profit. The three licensor firms are charged with imposing upon other firms in the combination an undesirable restriction upon output, and the observance of patents which have been quashed in the Courts. The Sub-Committee sees a risk of the British lamp industry being subordinated to American or international control, and calls for the institution of national control in the hands of a Department of State. Thus the Report ranges from criticism to indictment, from statements of fact to proposals for legislation.

In pre-war times we often lamented the fact that the prices obtained for electrical manufactures in this country were inadequate to provide that reasonable margin for

research and development, without which it was impossible for the industry to keep pace with the progress of its more fortunate competitors in foreign countries. We cannot, therefore—nor do we wish to do so—reproach the manufacturers for adopting the only means at their disposal for attaining this end, provided, of course, that the margin *is* a reasonable one. Further, we have consistently supported the claims of traders to recognition by the manufacturing firms in the shape of trade discounts which are withheld from the general public; and we have maintained the unquestionable right of the inventor and patentee to the just reward of his labour and ingenuity. All these points are involved in the question of price maintenance, and all of them, we believe, will command the approval of our readers. But the question is raised whether, in this case, the various margins of profit are in due proportion, and of reasonable dimensions.

In the space at our disposal we cannot discuss the matter at length; briefly, we hold that, while the manufacturers certainly erred on the safe side in pre-war days, and might well have reduced their selling price to the trade, the fact that that price to-day remains almost the same, although the value of money has fallen to less than half the pre-war standard, indicates that, relatively to other commodities, the price of lamps to the trade has fallen to a value which is no longer unreasonably inflated. It should be borne in mind that patent rights are of limited duration, and are liable at any moment to become valueless owing to the introduction of improved methods. How much the associated firms have spent on research in this connection, we do not know, but it is within our knowledge that the equipment of the largest factory in this country was scrapped repeatedly in pre-war years, and the British patent rights were acquired at a heavy cost. So much for the manufacturers' position; the case of the distributors is on a different footing altogether. They run no great risk of patents being quashed or superseded, they incur no outlay for patent rights or for research, they have no plant to become obsolete—they are purely middlemen, and the bigger they are, under the Association system, the bigger are their profits and the easier their functions. While we adhere to the doctrine of trade discounts, we feel that in the lamp trade the rates of discount have been inordinately and quite unnecessarily high. We see no reason why a dealer in a large way should be in a position to pocket from 1s. 2d. to 1s. 6d. per lamp—more than the net cost of manufacture! In the case of bicycles, typewriters, &c., it is notorious that similar conditions have obtained, but the circumstances have been very different, and we believe, with the Sub-Committee, that the price to the public should have been greatly lowered, together with the trade discounts.

The statement that the importers and distributors of Dutch half-watt lamps during the war made a profit of £280,000 in excess of a reasonable value is generally regarded as the most serious and damaging item in the Report. These lamps could not be made in this country at the time, and therefore were imported under licence of the Board of Trade. The Sub-Committee has assumed that the difference between the list price of the most popular size of half-watt lamps and the price at which it could have been put on the market (12s. 6d., less 8s.) represents the "excess profit" per lamp that actually accrued to the trade, but we understand that the vast majority of these lamps —80 to 90 per cent.—were supplied to Government departments and controlled firms at a price in the neighbourhood of 8s., and that not 5 per cent. of them were sold at 12s. 6d., so that the sum named is at least £250,000 in excess of the true profit. The reason for listing the lamps at a high figure is admitted in the Report—namely, that the British lamp makers, who intended to manufacture the lamps themselves as soon as circumstances permitted, could not be expected to encourage the sale of the imported article to the public. As a matter of fact, they obtained the machinery for making argon gas from the Dutch firm at a heavy cost and under onerous conditions, after protracted negotiations, and commenced the manufacture as soon as possible, at the same time lowering the list price of the lamps.

The reproach that the three licensing firms imposed restrictions upon the output of the firms that they admitted to the Association must be considered in the light of the fact that they were under no obligation to issue licences at all, provided that they themselves were able to cope with the demand for vacuum lamps. The alternative course would have resulted in putting the seven British companies out of business altogether, a consequence which could only be regarded as highly undesirable. By enabling these companies to continue in operation, with the benefit of the information derived from research, and to increase their output at a moderate pace, whilst paying royalties which could not be called excessive, the Association unquestionably acted in the interests of British industry. But the second item in this charge—that the Association took advantage of its position to compel the licensees to treat invalid patents as though they continued in force—bears a different aspect. Besides its injurious effect upon a British firm of tungsten wire makers, it constituted a wholly unwarranted extension of a monopoly which was no longer justified by letters patent, and established a principle which might be extended without limit—namely, that any material that the Association chose to specify must be purchased from a member of the Association, at, of course, any price that the member chose to name. This is a proceeding which we regard as reprehensible and contrary to the interests of British industry.

The last paragraph of the Report is the only one that embodies a definite recommendation—namely, that trade combinations should be brought under the control of a Department of State. Viewing the question broadly, as affecting all such combinations in all industries, we are disposed to agree with the Committee. As we have said above, not all "Trusts" are maleficent; but some undoubtedly are, and we believe that the establishment of some such controlling authority, while it would relieve the public mind and guard against abuses, would at the same time protect the beneficent type of Trust from unfounded charges.

In the present instance, while the inquiry was certainly justified by its results, and has brought to light the existence of practices which, in our opinion, ought to be discontinued, we do not feel that anything in the nature of a scandal has been revealed. The Report in various places commends the action of the Association; it points out that the price of lamps was prevented from rising as well as from falling, and it commends the Association for removing the restrictions on output of the licensees during the war. In many places it suggests undesirable things that the Association might do if it chose, whilst admitting that it did not so choose. It points out that the licensees' output for export was not restricted. It commends the Association for undertaking to supply bulbs and caps to all lamp makers without discrimination. It points out that without some combination the British lamp-making industry could not have held its own against foreign competition, and agrees that profits should be adequate to provide for research and experiment. In fact, the Report is far from being so condemnatory as the extracts selected by the daily Press would lead one to believe. We understand that one of the largest British works was about to be doubled in capacity when the war broke out, and that the extension is only now delayed by the dilatory methods of the building trades; when the new factory comes into operation, prices will be lowered. But for the fact that, before the gas-filled lamp was invented, the use of United States patents had been secured to this country by the formation of the Association, we should have been at the mercy of American manufacturers in respect of the half-watt lamp. New Westlake machines have been bought at an enormous price from the United States, and are now at work in the North, rendering this country independent of imported lamp bulbs. In two years, we are informed, prices will be reduced 40 per cent. owing to increased output; cheap lamps are essential to the development of the electric lighting industry, and the prospect of a material reduction in price will be generally welcomed.

We have no doubt that the Association will give careful consideration to the contents of the Report, and we hope that the undesirable methods to which we have drawn attention will be especially scrutinised, with a view to their modification or abolition.

ELECTRIC POWER AT THE WORKS OF THE VAUXHALL MOTORS, LTD.

At the invitation of Messrs. Vauxhall Motors, Ltd., we recently paid a visit to the company's works at Luton to see the electrical equipment, which is described below. This concern is an offshoot of the Vauxhall Ironworks Co., of Wandsworth Road, London, which built the first Vauxhall car in 1903; two years later the company moved to Luton, and in 1907 Vauxhall Motors, Ltd., was formed as a separate company, to devote itself entirely to the manufacture of motor-cars. In the following year the Vauxhall car was the only one which passed through the 2,000-mile International Reliability Trial of the R.A.C. without losing a single point, and without replenishing water or lubricating oil, thus at once establishing its reputation as one of the finest cars of the time. Aided by exhaustive research at a heavy cost, the company rapidly improved its engines and chassis, and in 1910 a 20-h.p. Vauxhall car attained a speed above 100 m.p.h.—a record for that rating, which was followed by many other striking feats, including the winning of 80 first prizes and highest awards in 1913, a greater achievement than that of any other car. Then came the war, and the company's whole output was supplied to the Government, consisting entirely of 25-h.p. cars for staff use.

Important extensions became necessary, and the works were reorganised on the most modern lines, involving the use of electricity in a variety of applications—lighting, power, telephony, time service, and the heating of the offices—and we have no hesitation in describing the factory as a model of its kind, laid out and equipped on scientific lines and maintained in the highest degree of efficiency.

The workshops are of one storey, and are built with woodlined saw-tooth roofs for north lighting; they are provided with heating pipes overhead, a system which has proved thoroughly satisfactory. Owing to the adoption of the individual drive, the new machine shop, with which we are mainly concerned, is of light construction and moderate height, with comparatively few columns to carry the roof. "General" lighting has been carried out with semi-indirect fittings suspended from the roof, on a scale which renders the use of auxiliary lamps superfluous. Grinding and wood-working machines are provided with powerful exhaust fan draught to carry off dust and shavings. Perfect cleanliness and order are enforced in all departments—the floors are immaculately clean and tidy, stands are provided for workmen's hats and coats, and a large well-lighted mess-room adjoins the workshops.

To maintain the highest quality of the company's products, and to minimise waste of labour, an exceptionally complete system of inspection is in force. Every class of raw material is tested on delivery by chemical analysis and mechanical tests, well-equipped laboratories being provided for this purpose. Special attention is given to the heat treatment of steel, for which purpose electrical furnaces are admirably suited, and are therefore employed. The microscope plays a prominent part in these tests. After each

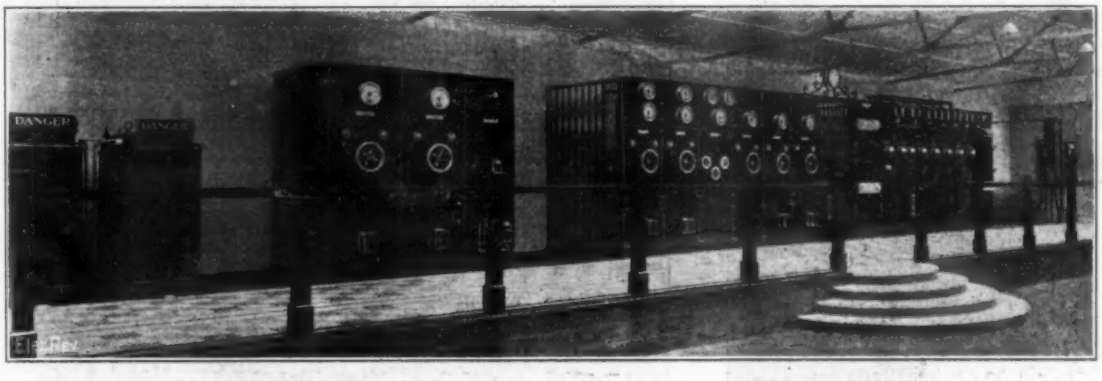

Fig. 1.—Transformers, Main Switchboard, and Time Control Board.

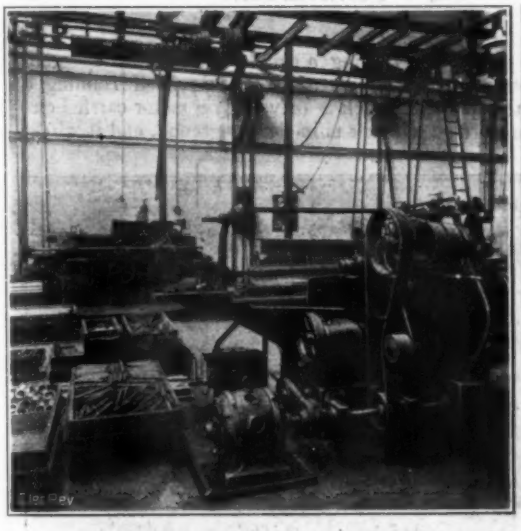

Fig. 2.—Grinders Driven Direct and by Belt.

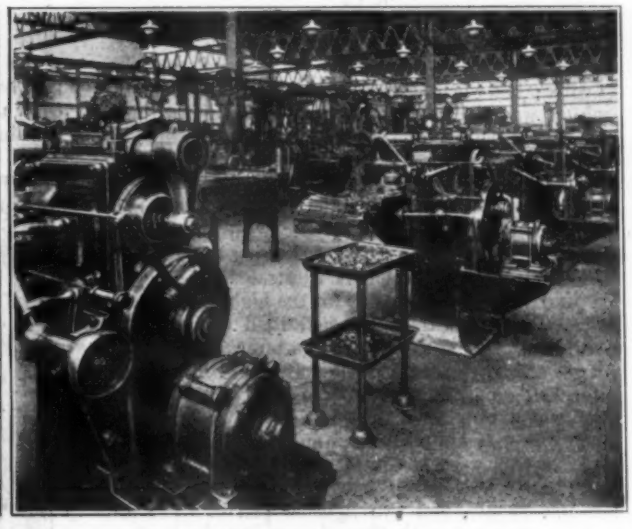

Fig. 3.—Milling Machines Driven by Geared Motors.

machinery operation, each part passes through the viewing room before re-issue for the following operation, thus ensuring that hidden faults shall be detected at the earliest possible stage. The Newall system of limit gauges is in use, to obtain interchangeability, and jigs are used not only for the metal parts of the car, but also for the wooden parts of the car-body. By such means the greatest economy of time and labour is secured.

Like the Austin Motor works, whose power plant we recently described, the Vauxhall works were originally

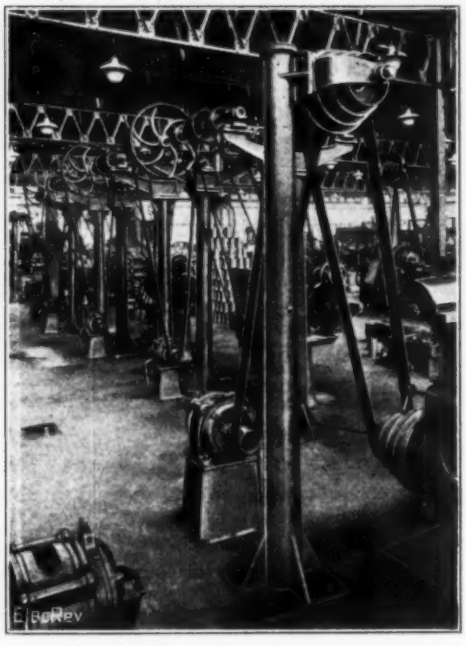

Fig. 4.—Individual drive with Countershafts.

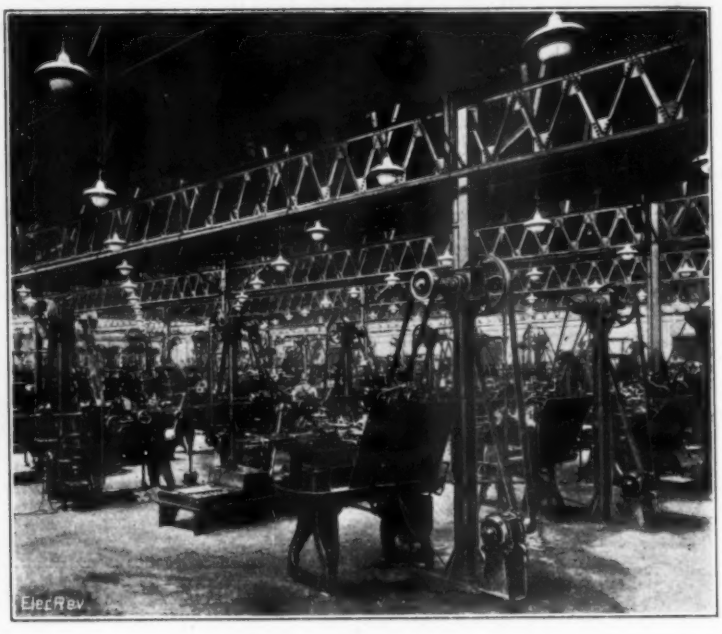

Fig. 5.—Individual Drive with Change-Speed Gear Box.

driven by direct current, supplied by the Luton Corporation at 500 volts; but when the works were extended on the outbreak of war, the new shops were equipped for three-phase current, and at the same time the principle of individual motor drive was adopted. The sawmills, repair shops, and offices, are still supplied with direct current. The A.C. supply being given at 6,600 volts, transformers of 125 K.V.A. each were put in, together with a handsome switchboard, mounted on a dais overlooking the assembly shop. The switchboard, which is illustrated in fig. 1, is divided into three sections: one for the high-pressure side of the transformers at the left hand, fitted with oil-break switches, ammeters, and three supply meters; one with two transformer secondary panels, each equipped with a switch, voltmeter, and ammeter, a summation panel provided with ammeter (which can be connected with any phase), watt-meter, and power-factor meter, and an earth indicator, and three feeder panels each equipped with a switch and ammeter: and a section consisting of seven circuit panels for the D.C. supply, and two lighting panels. The A.C. switches are all fitted with time-element overload relays, and are mechanically operated by means of hand-wheels. The A.C. power supply is given at 440 volts, and the A.C. lighting circuits are fed through transformers at 250 volts. The transformers are oil-cooled, and were made by the Brush Electrical Engineering Co., Ltd., while the A.C. switchboard was supplied by Messrs. Johnson & Phillips, Ltd., and the D.C. board by Messrs. Bertram Thomas.

An additional transformer, of 250 K.V.A., is on order, and with the corresponding switchgear will fill up the whole space available. The D.C. load, which includes a very heavy lighting load, amounts to 100-150 KW. The circuit-breakers on the main switchboard which control the office lighting are operated by push-buttons in the general office. The earth indicator consists of three lamps—red, green and yellow—connected between the three phases and earth, and is always in circuit; an earth on one phase causes the corresponding lamp to go out, whilst the other two brighten.

The assembly shop was originally used as a machine shop, and was built to carry shafting and a crane; the adoption of individual drive enabled a lighter construction to be used, with a lower roof, thus saving on capital cost. The belt-driven machines had to be adapted for individual drive, and the various methods adopted for this purpose are exceptionally interesting.

Fig. 2 is noteworthy, as showing contrasted the old and newer methods of driving a grinder; the former is seen in the background, with an elaborate overhead framing to carry the shafting, which is driven by a motor carried on a wall-bracket; the latter is in the foreground, and it will be

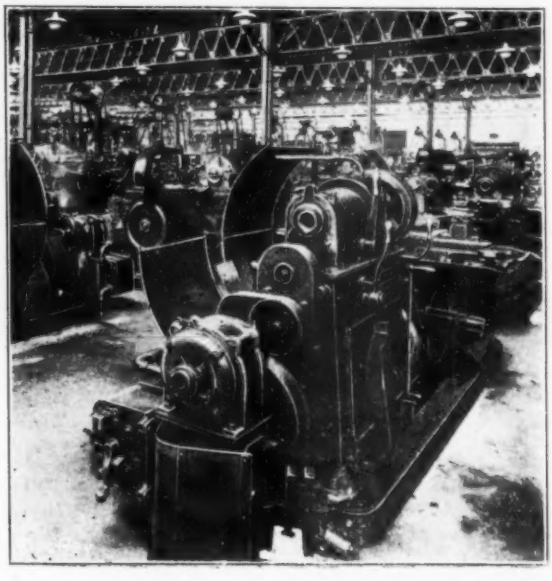

Fig. 6.—Automatic Lathes Direct Driven by Motors.

seen that the motor is fixed on the floor behind the grinder, the starter being attached to the frame of the machine. Fig. 3 shows a row of Parkson milling machines; here the 2-H.P. motor is mounted on the machine itself, and drives by spur gearing. Fig. 4, again, shows a totally different

device; the 2-H.P. motor, fixed on a short pedestal, drives by belt two short countershafts mounted on the top of a column, from which the Archdale thread-milling machine is driven. In fig. 5 we have a variation of the last device; in this case two rows of Ward turret lathes have been adapted to individual drive by mounting a Vauxhall change-speed gear-box on the top of the column, as the intermediary between the 1-H.P. motor and the lathe, with belt drive.

A row of Potter & Johnson automatic lathes is seen in

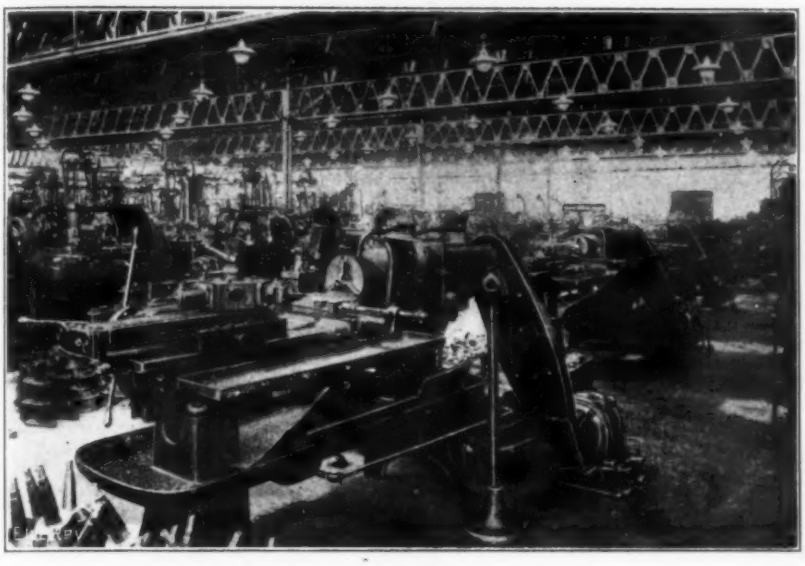

FIG. 7.—CAPSTAN LATHES WITH CHAIN DRIVE.

fig. 6, with 4-H.P. motors geared direct to the main shafts. There are 40 of these machines.

Fig. 7 shows a range of Herbert capstan lathes driven by Renold chains, the 4-H.P. motors being fixed on the floor, with a device for tightening the chains, and adjusting the guard. Lastly, fig. 8 shows a neat method of arranging the chain and belt drive of a multiple-spindle drill.

Power is brought to the machines in a systematic way.

FIG. 9.—BACK OF FUSEBOARD.

Three 36-way distribution fuse-boards, by Messrs. Johnson and Phillips, are fixed at intervals in the end wall of the shop, which is about 14 in. thick; the back of the board is accessible from the exterior, as shown in fig. 9, on the removal of iron shutters—an extremely neat and convenient device, which at the same time reduces the space occupied to the minimum. A lighting transformer is housed in a pit in front of each board, and Key fibre ducts are carried from the boards along the end of the shop, and in parallel runs of four, tapering off to three and two, transversely to the shop, with hand-holes at frequent intervals, so that there is a hand-hole near every machine.

There are over 10 miles of cable under the floor of the machine shop; all the large machines are on separate circuits, and in addition to the fuses on the distribution boards, each motor is protected by overload relays and no-volt release coils on the larger sizes and triple-pole switch fuses on the smaller sizes.

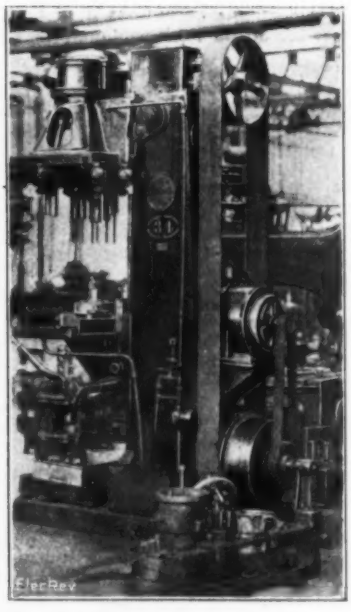

FIG. 8.—CHAIN AND BELT-DRIVEN MULTIPLE DRILL.

From the hand-hole a steel pipe is led to the starter, and is connected to the frame of the machine, as well as to an earthing wire in the ducts. No cable is exposed anywhere. The hand-holes are of concrete, and are covered with chequer plates. On each fuseboard is an earth indicator, like that on the main switchboard, by the aid of which a fault can be located and rectified before any serious trouble can develop. Any motor in the shop can be fed from either of the three distribution boards, thus enabling the load on each panel to be balanced. There are 270 motors, ranging from ½ H.P. to 20 H.P.; all from ½ to 4 H.P. are made by the British

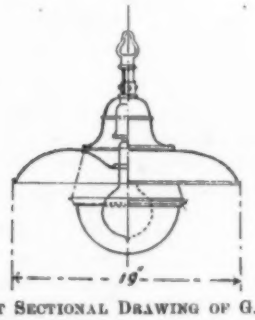

FIG. 10.—PART SECTIONAL DRAWING OF G.E.C. FITTING.

Thomson-Houston Co., Ltd; the 5-H.P. motors are by the British Westinghouse Co. (now Metropolitan-Vickers, Ltd.), and the larger sizes by Messrs. Crompton & Co., Ltd. Thus the number of spares to be stocked is kept down to the minimum. Motors up to 4 H.P. are switched directly on to the mains without any starter, and, if necessary, are reversed in the same way, without any pause. Above 4 H.P. star-delta starters are used, and for 15 and 20 H.P. auto-transformers are provided.

As we have already mentioned, the lighting of these shops is carried out on a liberal scale, so that the same high degree of accuracy can be maintained as easily under artificial light as in daylight. In accordance with the recommendations of the Illuminating Engineering Department of the General Electric Co., Ltd., the degree of illumination varies in the different shops, according to the type of work done in each, and ranges from 4 to 7 ft.-

candles; uniform illumination is aimed at throughout the whole area of each shop, eliminating shadows and dispensing with local lighting. The lamps used are 100-, 150- and 200-watt Osrams of the "Atmos" type, and the fitting is known as the G.E.C. FA 9360. It is illustrated in fig. 10, p. 389. There are in the machine shops 275 semi-indirect 200-watt lighting fittings. One-third of the lighting is supplied from each main distribution fuseboard, and there is a Tucker 30-ampere switch on every column con-

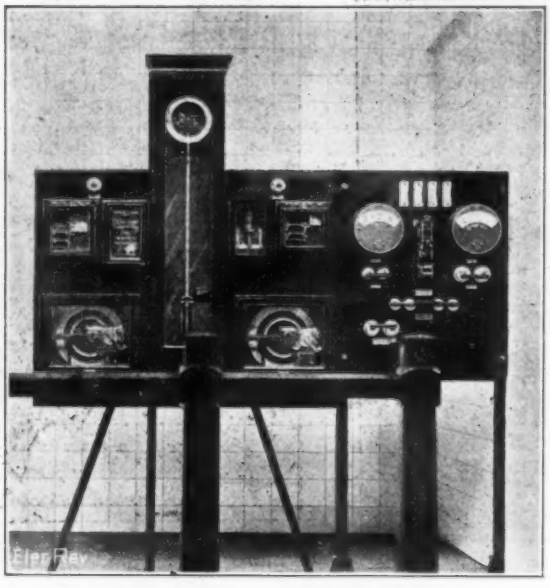

Fig. 11.—Gent Time Control Board.

trolling a group of 10 lamps in the immediate vicinity. No other lamps are used, and, although the lighting consumption is fairly heavy, the company considers the money well spent. The lighting cables are run in screwed conduit.

The lamps are well seen in figs. 5 and 7.

The time-service system was supplied by Messrs. Gent and Co., Ltd., and comprises an accurate transmitter con-

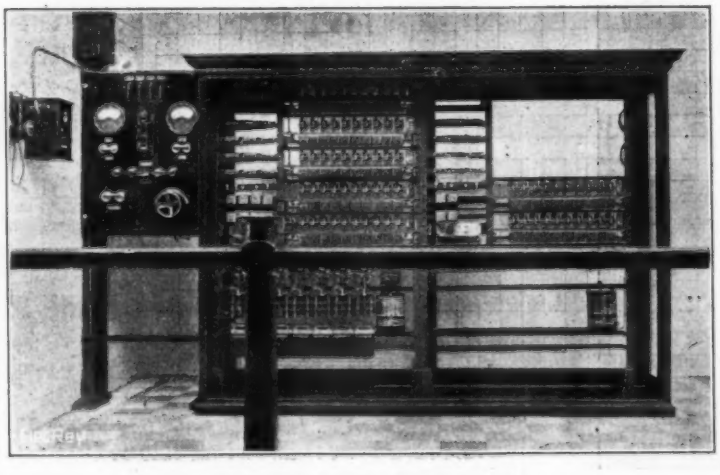

Fig. 13.—Siemens Automatic Telephone Exchange.

trolling some 40 dials and Gledhill-Brook time recorders distributed throughout the shops and offices. The main board is shown in fig. 11; it carries the transmitter, two programme ringers, two relays, and a warning bell, as well as the battery-charging switchgear. The programme ringers each contain a large metal ring with a series of holes into which pegs can be inserted, enabling any desired programme of signals to be automatically given, which can be changed at will. In this case bells in the works are sounded twice at five minutes to the hour of commencing work, and once at the hour. A different programme is provided for the offices. Current impulses are transmitted at half-minute intervals to the dials and recorders, which are all connected in series, the pressure employed being 110 volts. The recorders are controlled by a device similar to that shown in fig. 12, which releases the spring-driven movement every half minute, and allows the mechanism to advance by a corresponding amount. Thus uniform time is maintained throughout the establishment—a factor of no little importance.

An automatic telephone system, supplied by Messrs. Siemens Bros. & Co., Ltd., is installed in the works, in addition to the Post Office private branch exchange; the switchboard provides for 70 lines, with seven selectors, and is illustrated in fig. 13. It is mounted in a handsome cabinet on the switchboard platform, and close to it is a neat little battery room containing the batteries for the time and telephone services.

Central heating is employed in the offices, supplemented by electric radiators. In the messroom, part of the cooking is done electrically, a potato steamer proving most useful,

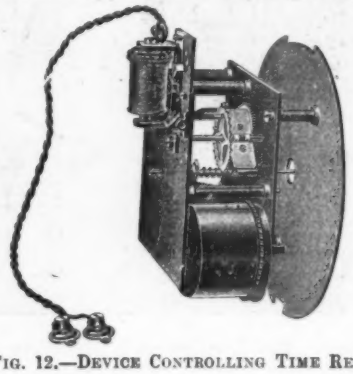

Fig. 12.—Device Controlling Time Recorder.

as well as an electric oven, both of Messrs. Crompton's make.

The offices are very handsomely constructed and equipped. For the purpose of sorting and tabulating the shop time cards, machines made by the British Tabulating Machine Co. are used, which perform their work with extraordinary speed and certainty, and save a vast amount of clerical labour and mistakes.

That the interests of the work-people are well looked after by the company was obvious on every hand.

The whole of the electrical and mechanical equipment was designed and carried out by the company's own staff. The adoption of the individual drive has proved wholly satisfactory; the cost of the installation, allowing for the reduced cost of buildings, and the abolition of shafting, is somewhat greater in the first instance, but the advantages gained far outweigh this drawback. The failure of a motor affects only one machine. When a machine stops, the consumption of energy for it ceases also, and the all-round saving of energy due to this and to the absence of friction losses in the line shafting is remarkable. It is best illustrated by the fact that *since the adoption of the individual drive, the plant has been doubled without increasing the consumption of energy.* The use of three-phase motors has also been justified by the results; even the smallest motors—down to ½ H.P—are fed at 440 volts, and the number of breakdowns has been trifling.

In conclusion, we have to thank Messrs. Vauxhall Motors, Ltd., for the opportunity of visiting this interesting installation, which exemplifies the latest practice, and photographing their machines. We are especially indebted to Mr. G. C. Jack, assistant works manager, for the courtesy with which he conducted us over the works.

ELECTRICITY IN THE WESTERN WAR ZONE.

By Major T. RICH, O.B.E.

The author, having been connected with the electrical power side of military engineering during the last three years, and having had opportunities of studying war and pre-war methods of the French and Germans in north-east France and Flanders, thinks that some random notes might be of interest. The more the past is discussed, its failures or successes, the greater the chances for the future, and with these views in mind the following notes have been prepared. The work done by the British Army will be noted from time to time, but space does not allow of detailed particulars; good work was done, largely in accordance with local standards, in the face of great difficulties and frequent discouragements; we "muddled through" as in nearly everything done in the war, but there is evidence that the military "powers that be" now realise that electricity in warfare has come to stay.

In France, owing to legislation based on the desire to assist rather than to obstruct, very great development has taken place before and during the war, and although local conditions differ, and we have nothing similar to the Prefectural system, there is no reason why many of the features existing in France should not be adopted in the United Kingdom; the present would seem to be an opportune time for the discussion of such questions.

The author in preparing the following notes wishes to acknowledge the assistance and large amount of information continuously given him in France by officers of the Service Electrique of the French Army, and by the officers of the Military Electric Light Companies, and especially the late Col. Pierart, Major Redan, Capt. Boulanger, and the managers of power companies and others who freely gave particulars of their technical experiences. The Service Electrique supplied the author with a number of plans and photographs to assist in the preparation of this article.

The war has brought many allied professional men together, and it is to be hoped that practical steps will be taken to keep alive the good feeling which existed during the war between British and French electrical men.

Electricity has become since the beginning of the century a valuable factor in warfare; the increase in the use of scientific engines of offence, and methods of defence, has led to its general employment.

France and Germany started the war with the great advantage of national service, with the result that their armies were at one with the people. As practically all engineers and scientific men under such a régime had to take part in some form of military training, the liaison between the soldier, the engineer, and the scientist was much closer than it has been, or probably can be, with a professional army. A nation in arms gives the army the first pick of engineers and electricians, without the backstairs intrigue of local tribunals, and as all members of Parliament must have served in the Army, and have learned something at least of the elements of duty, it is difficult for any trade union leaders to get any trade made immune from service; it was, therefore, much easier for French and German Electrical Companies to get the men they wanted than for us to do so.

When the war broke out the Germans had already studied the problems of the use of electricity in the war zone, and had detailed information ready regarding the lighting and power systems in France and Belgium.

Although electric light work had been the subject of detailed study by French military engineers before the war, a definite electric power organisation was started only about a year after the war began, but the elastic organisation of the French army lent itself to rapid development, and in a very short time 500 km. of H.T. line were erected.

Electric light distribution, with the aid of comparatively inexpensive expedients, is to be found in about 4,000 communes in France and 12,000 communes in Germany, and officers and men in both these armies were accustomed to see power lines along the high roads. The necessity of providing the personnel for such work was recognised, and regulations were drawn up with the approval of the general staff which made the operation and utilisation of such lines a possibility, even in modern warfare.

During the war the Germans probably erected on the West Front over 2,000 miles of H.T. line, of which several hundred were at 30,000 or 45,000 volts; and sufficient steel cross arms were found in stock at one German depot after the armistice for 500 miles of 45,000-volt line, and a large stock of heavy poles for a similar length was being collected. French military engineers put up well over 1,000 miles of H.T. line, and were engaged in the erection of a line, largely with Algerian rough labour, at 90,000 volts. That is to say, the French and Germans combined put up probably more overhead power line during the war than existed before the war in most parts of the British Empire (outside Canada) put together.

Concessions and Regulations in France.

In France it is recognised that if the supply of electricity in rural districts is to become an economic possibility, power lines must be built of an inexpensive character, and the amount of apparatus cut down to the absolute limit. In order to prevent or limit the dangers of local blackmail, maximum payments to communes or other bodies are laid down, the fees diminishing with the population, while the ultimate power of veto practically remains with the Prefect.

The Government laws and regulations compared with those in the British Isles are very fair, although some American officers have considered them more stringent than those in some States of the U.S.A. The laws and regulations do not have penalties on every page, in fact, when looking through them, it is difficult to find any. The Government telegraph authorities are comparatively reasonable, and the railways have come to the conclusion that H.T. crossings, when designed with common sense, are not a continuous source of danger. In many areas even where steam is the motive power, electricity has become the poor man's light; the use of 110/190 volts A.C. naturally tends to obviate the use of expensive fittings and wiring, and fatalities at this voltage are exceedingly rare.

It has at times been urged by those, whose sense of technical propriety is offended by inexpensive structures or lines, that the climate of the Continent is much more favourable to overhead distribution than that of the United Kingdom; but those who have spent several years in the Departments of the Nord or Pas de Calais agree that there are storms as severe and snow as thick as any experienced at home.

The regulations relating to electricity are formed after consultation with a permanent Government Electrical Committee of 30 members; half of the number are professional and business representatives of the large electrical industries, and the other members are co-opted from the Government Ministries of the Interior, Public Works, Commerce and Industry, Posts and Telegraphs, War, and Agriculture. The rules are revised from time to time to conform with the progress of technology and business, therefore there is little danger of their becoming a stumbling block to the development of electricity supply. It is usual to get an electricity supply declared a "Utilité Publique," whereby certain privileges of the Public Works are enjoyed, and the planting of posts, trimming of trees, attachment of conductors to houses and other easements, can then be usually obtained with-

out much trouble or expense. The engineer of a large power company told the author that he had once obtained concessions in 15 communes after only a few days' work. Owing to the earlier development of gas lighting the law allows a monopoly of illumination, but not for power or for industrial lighting of factories as an adjunct to the power supply. Electric light and power is, therefore, usually in the hands of gas and electricity companies. As a rule this fact does not seem to have checked the use of electricity very much, although some cases have occurred where the Germans connected a town to power mains, and after the war the lines were not repaired or lighting continued, because of the gas monopoly. Although France is a democratic country, the local authorities are usually sufficiently intelligent to understand that the development of electricity is of public and national interest, and that for efficient working and development, especially in rural districts, it is best to leave the business in the hands of experts, rather than to allow self-advertising tradesmen or "friends of the people" to interfere in matters they do not understand, taking a certain proportion of the receipts of the companies, directly or indirectly, by way of octroi, wayleaves, and other forms of contribution. In Paris, however, where the professional politician has perhaps more scope, some of the electricity and traction companies have been very badly treated.

There is always a tendency for people to think that arrangements elsewhere are the best, especially when faced with worrying opposition or formalities at home, but as far as France is concerned "the proof of the pudding is in the eating," and the very rapid development of electric transmission during the three years before the war, even in areas where there is no extensive water power available, is proof that investors are confident of having fair play, and "a run for their money." This is a remarkable contrast to the treatment of a large Scottish water power scheme during the war, when a Bill was thrown out mainly because there was a danger that the promoters and owners might make a profit out of their enterprise, despite the large amount of labour likely to be employed.

Factory owners in a number of country districts supply light and power to surrounding areas, the supply being often facilitated by the initial supply to the houses of their employés; the cost of obtaining the concessions is trifling in comparison with the general convenience to the neighbourhood, good lighting being naturally attractive to good workmen. In one place visited a mill supplies several villages along about ten miles of road from a 30-KW. alternator, transmitting at 5,000 volts. In another case the owner of a water mill obtained a concession as a hobby for his son, and supplied a neighbouring village from a turbine-driven alternator of 25 K.V.A. generating at 3,000 volts, the sole staff during the war being the proprietor, aged about 70, and his wife.

Many people do not realise that in many ways the Frenchman's methods and laws are based on sound common sense. He wants to keep workpeople in the country where they can have healthy surroundings, and not fall so ready a prey to professional grievance-mongers as if they were cooped up in large cities; he realises that a convenient supply of electricity is a most powerful factor in this direction. In many parts of the north of France village industries abound, especially the making of embroideries and such work, extra work being done in the winter when there is less to be done in the fields or small holdings; in some villages or small towns the horse power in small motors connected is astonishing. When the Germans ransacked the north they took away with them much of the small machinery in order to teach their own people, and rob France of the trade.

When "Long Bertha" (named after Bertha Krupp) began to bombard Paris, the process of removal of several important factories and industries out of Paris was accelerated, and a number of new factories sprang up in the south and west, especially in the Seine Valley. The process of removal to more healthy surroundings was distinctly encouraged by the Government, and the result of the bombardment may have an important bearing on the life of the future. It must be said that since the war France has "found herself" as a manufacturing nation; the development of Lyons, Clermont-Ferrand, and many other towns outside the danger zone has been astonishing, and there is little doubt that before long she will be able to replace or rival Germany in the trade of the world in many items.

When the public roadway is used for erection of power lines or roadside sub-stations, the following charges are paid to the State, Department, or Commune, for "Routes Nationales," departmental, or communal routes respectively:—

Situation.	Annual payments. Per km. line overhead or underground.	Per post or support.	Per sq. metre occupied.*
Paris	100 fr.	10 fr.	25 fr.
Communes of 100,000 inhabitants and over ...	20 „	2 „	5 „
Communes of 20,000 to 100,000...	10 „	50 cm.	2·5 „
Communes under 20,000	5 „	25 „	1 „

* For transformer sub-stations or other structures.

Where more than one line is put on the same support or cables are placed side by side in the same trench, the length is considered as one line. When special concessions are made by a commune, and as an alternative to the above, the following maximum charges can be made:—

	Percentage of receipts. Lighting.	Power.
Paris	10 p.c.	5 p.c.
Communes of 100,000 inhabitants and over	4 „	1·5 „
Communes of 20,000 to 100,000	3 „	1 „
Communes below 20,000	2 „	0·5 „

The lighting which is accessory to the use of power for industrial purposes is included with power in the percentage payments. Certain small charges are made for the expenses of Government control. Propositions for large schemes are examined by committees nominated by the Prefect, or in the case of smaller schemes covering a commune or syndicate of communes, by a commissioner nominated by the Prefect, after notice has been sent to Mayors of Communes. Regulations have been drawn up to prevent delay and to allow of the rapid subsequent execution of secondary lines and branches. During the war an arrangement was arrived at in many districts, with the assistance and approval of the Ministry of Public Works, for the charges for power to be increased by 2 mils, that is 2/10 of a centime, for each franc rise above the pre-war price of coal per ton. As there are 1,000 mils to the franc, and 1,000 kilos to the ton, this means an allowance of 2 kg. of coal per unit sold, which, after allowing for inferior war-time coal, expensive oil and stores, went some way towards extra war costs; in some cases of small stations a further extra charge was allowed. Some British officers who based their estimates of the cost of power upon the estimated consumption of petrol alone at 1s. a gallon, looked upon French charges for power as exorbitant.

It cannot be said that all French power companies are paying concerns, some distinctly are not; a number of the companies own six or more systems, some are connected with manufacturing concerns, and others are quite independent.

(To be concluded.)

The Portsmouth "Leader" Cable.—The "Leader" electric cable which has just been installed at Portsmouth Harbour is likely to prove of very valuable assistance to the navigators of ships when low visibility prevails. The cable, which is an armoured one, lies at the bottom of the fairway, the land end being connected with an alternating source of supply. Interruption of the current corresponding to prearranged signals of the Morse code, conveys to ships fitted with the necessary receiving apparatus their position in the fairway to within 500 yards of either side of the cable. An Admiralty order on the subject gives certain details relative to the position of the cable at various points in the approaches to Portsmouth. The advantages of the "Leader" system in thick weather are very obvious.

THE LONDON FAIR AND MARKET.

The second annual Fair and Market organised by the International Trade Exhibitions, Ltd., was opened at the Royal Agricultural Hall, Islington, on March 16th. It was the only trade fair of its kind held in this country that was international in character, and at which were displayed many and varied fancy goods, jewellery, and toys. The public was not admitted, the fair being held for the transaction of strictly wholesale business. The exhibition closes this evening.

The exhibits included goods contributed by Czecho-Slovak firms, and others came from France, Italy, Spain, Holland, Japan, Canada, and the United States of America. It was estimated that 70 per cent. of the exhibits were British. Goods were displayed on 421 stands, on some two dozen of which electrical or allied manufactures were shown. The stands devoted exclusively to exhibits of an electrical nature were few in number.

Electrically-operated vacuum cleaners were shown on five stands, being exhibited by the Electric Appliances Co., Ltd., London; "Gem" Labour-Saving Device Co., Manchester; Hoover Suction Sweeper Co., U.S.A. and London; Magic Appliances, Ltd., London; and the Rex Import Co., Ltd., London.

The latter firm also exhibited a compact self-generating pocket electric lamp, the dimensions of which were about 1·5 in. by 3 in. diameter. The lamp is held in one hand, while with the other a ring attached to a cord is pulled, thus operating a ratchet and revolving magnet mechanism, which generates the necessary power to light the lamp. The cord, on being released, is automatically re-wound ready for the next pull; meanwhile, the lamp burns steadily.

Another novelty shown by this firm was an electric hair-brush, illustrated in figs. 1 and 2, which generates its own energy. The "Rex" brush, which is no larger than an ordinary hair-brush, and the metal bristles of which are carefully made so as not to irritate the scalp, applies, it is claimed, a high-frequency current to the

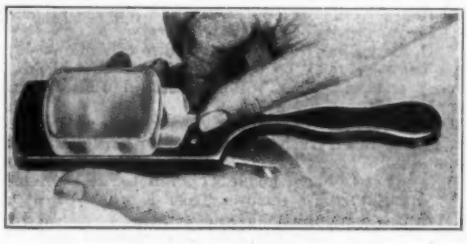

Fig. 1.—Self-generating Electric Hair Brush, showing how the Regulator is operated.

scalp and roots of the hair, giving a tonic and invigorative effect. A sponge attachment is supplied with the brush to be used for treatment of the skin, and for applying the current to different parts of the body for the relief of pains. This sponge attachment is an insulator when dry, but when slightly damped it conducts the current to the face or skin without the slightest burning or shock. The operation of the brush is simple—a thumb pressure of a small, conveniently-placed lever, as shown in fig. 1, being all that is required to generate a continuous electric current; the power of which may be strengthened or weakened at will by adjusting the regulator on the back of the brush, also shown in fig. 1. No batteries are used in this brush; a small dynamo on the

Fig. 2.—"Rex" Electric Hair Brush with back cover removed.

back of the brush, fig. 2, generates the power. It may be worked at a speed as high as 10,000 r.p.m. The magneto armature is wound with very fine wire having almost 1,000 ohms resistance, and when the thumb lever is worked slowly, this armature spins at the approximate rate of 3,000 r.p.m.

Electrically-operated mechanical toys were on view on four stands, and were shown by the following firms:—Messrs. Roberts and Pitt, London, electrically-propelled boats; Indian and Colonial Supply Association, London, small motors and generators, coils, lamps, bells, batteries, &c.; Dubilier Condenser Co., Ltd., London, small motors and parts; and the Gilbert A.C. Co., U.S.A. and London, miniature chemical and electro-plating outfits, together with manuals for "magic" performances with the outfits, a complete outfit for teaching the fundamental principles of static electricity and magnetism, parts for assembling small motors, working miniature telephone and telegraph sets, including a wireless set whereby messages may be sent and received over short distances, different types of 110-volt motors, transformers, switches, shocking machines, &c.

Some seven firms exhibited electric lamp fittings and shades as under:—Messrs. Bulpitt & Sons, Ltd., Birmingham, aluminium lanterns; Albert Lee & Co., Ltd., London, electrical fittings, glassware, silk shades and batteries; Messrs. A. A. Mackenzie, Glasgow, agents for aluminium and brass candlesticks, mantle rod brackets, &c.; Messrs. Charles Sely, London, silk and painted lamp shades and telephone covers; Messrs. W. Soutter & Sons, Ltd., Hockley, Birmingham, electric lamp fittings, floor and reading lamps, kettles and stands, &c.; Messrs. Henry Wolff and Co., London, linen, silk and chintz lamp shades; and the Excelsior Shade Manufacturing Co., Nottingham, "Betterway" silk lamp shades and metal bands, as illustrated in figs. 3 and 4. This is an effective and inexpensive attachment which is

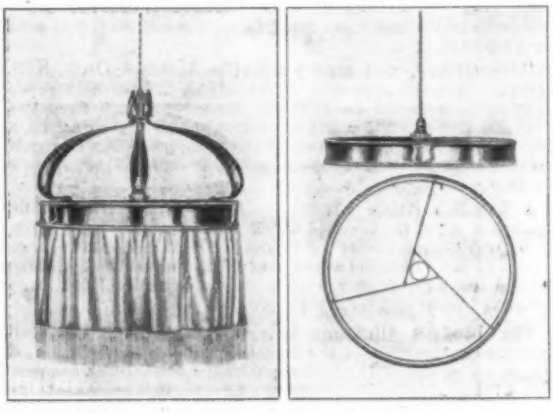

Fig. 3. Fig. 4.

"Betterway" Lamp Shade and Band.

supplied with a ceiling plate and three chains, or with scrolls, as shown in fig. 3, and a fixing disk which can be easily removed without detaching the lampholder. The band, together with the loose wire ring for fixing, is illustrated in fig. 4. The flounces are made of various materials, white lined, and are of artistic shades and designs.

Messrs. Beatty Bros., Ltd., London, had on view a number of washing machines and wringers, including an electrically-driven model.

The British Ever-Ready Co., Ltd., London, showed a selection of electric pocket, hand, cycle, inspection, and reading lamps, signalling lamps, lanterns, and various types of dry cells, batteries, and accumulators.

Messrs. Chollot, Paris and London, had a working exhibit of powerful "Tenor" motor horns, and factory sirens of various sizes and types both manually and electrically driven.

The Ebonestos Manufacturing Co., London, showed a variety of moulded articles suitable for motor-car lighting, medical appliances, and all classes of electrical work.

Messrs. Hooper & Edman, Ltd., Birmingham, amongst other exhibits, showed lamps, mirrors, aluminium ware, and electric motor-car lighting sets.

The Northern Rubber Co., Ltd., Retford, Notts., showed all kinds of mechanical rubbers, also asbestos and leatherite hose, tubing, sheets, blocks, &c., and electrical gloves.

The Remoline Co., London, in addition to hardware, had on view batteries for pocket lamps and other electrical goods.

Messrs. United Merchants, Ltd., London, exhibited, amongst other things, "Majestic" electric radiators, which are made in one pattern only, but can be supplied with either a single or double coil. The radiators, circular in shape, are very portable, light in weight, and the heat can be focused to any desired point.

Messrs. Siemens Brothers & Co., Ltd., London.—This exhibit comprised a large variety of fluid and dry cells and batteries, in the numerous sizes manufactured at the firm's Woolwich works, and included batteries for pocket lamps, torches, bells, telephones, indicators, medical apparatus, electric clocks and time distributors, laboratories, electrical testing, &c. The products shown on this stand were very similar to those that were on view at the recent Birmingham and Crystal Palace Exhibitions.

E

BUSINESS NOTES.

Industrial Council.—The following is a list of representatives who will act on the employers' side of the Home Counties (No. 9 Area) District Council :—

Municipal.—Messrs. Alderman Wilkinson, Reigate (chairman); Alderman Vaughan, Maidstone; Councillor Radford, Southend; Councillor Legg, J.P., Reigate; Mr. R. N. Torpy, M.I.E.E., Tunbridge Wells; Mr. R. W. L. Phillips, Bedford; Mr. C. A. Blascheck, Canterbury.

Company.—Messrs. A. I. S. Baron (Frinton-on-Sea and District Co.); W. E. Brandreth (Wycombe (Borough) Electric Light and Power Co.); H. Leslie Dixon (Leatherhead and District Electricity Co.); J. Eustace (Electric Supply Corporation, Ltd., Chelmsford); Arthur Grover (Hindhead Co.); T. Hesketh (Folkestone Co.); G. W. Spencer Hawes (Reading Co.); A. J. Wray (Banbury Co.). Secretary, T. W. Cole.

New Indian Electrical Companies.—Among the new companies recently formed in India are the British India Electric Construction Co., Ltd., 103, Clive Street, Calcutta, capital, 1,000,000 rupees, to carry on an electrical engineering business; and the Tata Electro-Chemical Co., Navassari Buildings, Hornby Road, Bombay, capital, 2,500,000 rupees.

A Satisfied "Consumer."—An electrical manufacturing firm that has been advertising in our pages for considerably over 20 years, writes expressing appreciation of the value of our advertising space. In a recent issue the firm advertised a new type of apparatus, and within seven days 27 inquiries and three firm orders were received.

"Gentlemen, you may Smoke!"—Messrs. Dick, Kerr and Co., electrical engineers, have started a three months' experiment at their Strand Road Works, Preston, in which from 10 to 10.15 a.m. and 3 to 3.15 p.m. the men will be allowed to smoke, on the condition that they continue with their work. This concession has been obtained by the shop stewards, who acted on the request of the men.

A Swedish Boiler Cleaning Co.—The Elektriska Pannrensings A. B., of Gothenberg, which has an ordinary share capital of 100,000 kroner, earned net profits of 92,300 kroner in 1919, and intends to pay a dividend at the rate of 20 per cent. The patent account has been entirely written off, the sum of 250,000 kroner having been provided for this purpose last year.

The Swedish Allmanna Co.—A preliminary statement issued by the managers of the Svenska Allmanna Elektriska A. B. records net profits of about 8,000,000 kroner for 1919, as compared with 7,718,000 kroner in the preceding year. It is proposed to pay a dividend of 10 per cent., this contrasting with 15 per cent. in 1918 and 20 per cent. in 1917.

Norwegian Cable Works.—The A. S. Nordiska Kabel og Traad Fabriker reports a surplus of 4,969,000 kroner for 1919, and a dividend at the rate of 25 per cent.

Catalogues Wanted.—The Peto-Scott Co., of 17, Frome Road, Wood Green, London, N., want catalogues, price-lists, samples, &c., from manufacturers of accumulators, dry cells, small motors, switches, small instruments, and miniature fittings.

Catalogues Wanted for Tanganyika.—The manager of the Electric Light Works P.W.D. Tanganyika Territory, Dar-es-Salaam, would be glad to have contractors' lists of electrical supplies of all descriptions suitable for a 440/220-volt D.C. supply, as the station is being rebuilt. The department is also supplying motors, lamps, fans, and cooking apparatus, with easily renewable elements.

Catalogues Wanted for Cuba.—The Commercial Secretary to H.M. Legation at Havana (Mr. G. T. Milne, O.B.E.), is desirous of obtaining for filing in his office, catalogues, price lists, &c., issued by United Kingdom firms, who are accordingly invited to forward copies of trade literature, to the Commercial Secretary to H.M. Legation, Havana.

Tramcars Wanted for Denmark.—According to Press reports from Copenhagen, the director of the street car system, which is owned and operated by the municipality, announced a short time ago that a number of new cars would be purchased in the near future. The motors in many of the cars were in bad condition and had been found to be too weak for the heavy traffic. This necessitated the installation of new motors in many of the old cars and the strengthening of many of the old motors. It was also planned to install electric heating in the cars. Nearly 1,000,000 crowns were to be expended for these improvements.

New French Company.—La Bougie R.S., Société Anonyme, is the style of a company formed at Courbevoie (3, Rue Louis Ulbach) for the making and sale of igniters for explosion motors, and more particularly the R.S. igniters patented in France. The capital is 425,000 fr.

Lyons Fair.—At the spring meeting of the Lyons Fair, held from March 1st—15th, the class of electricity was absent. It will, however, be included in the autumn meeting, and it is stated that already 3,000 exhibitors have entered their names, while 17 foreign countries, Allies or neutrals, will be represented.

Correction.—In their advertisement on page xxvii in our last issue, the City Electrical Co. quoted in error £81 as the price of the 1-KW. direct-coupled sets. The figure should be £91.

Book Notices.—"Pitman's Technical Bookshelf," March, 1920. No. 2 (23 pp.). London: Sir Isaac Pitman & Sons.—A general review of recently-published and forthcoming works of a technical nature, dealing with practically all branches, including wireless telegraphy, house lighting, textile weaving, &c. The notes form a complete guide as to the nature of each work, enabling the reader to tell at a glance whether it meets his requirements.

"The Amount of Steam Used by Steam Jets" (14 pp.). By D. Brownlie, B.Sc., &c. Reprinted from *Engineering*. London and Manchester: Brownlie & Green. Price 1s. 6d. This is No. 3 of a series giving exact data on the running of steam-boiler plants.

"Talks with Workers on Wealth, Wages, and Production." London: Sir Isaac Pitman & Sons. Price 2s. net.

Scientific Paper No. 361 of the U.S. Bureau of Standards. "Magnetic Testing of Straight Rods in Intense Fields" (13 pp.). Notes on the magnetic properties of ferro-magnetic materials. Scientific Paper No. 368. "Ionisation and Resonance Potentials for Electrons in Vapours of Lead and Calcium" (14 pp.). Copies of these papers may be obtained from the Government Printing Office, Washington. Price 5 cents each.

"Water Powers of British Columbia." By A. V. White. Ottawa (Canada): Commission of Conservation.

"The Practical Electrician's Pocket Book." London: S. Rentell and Co., Ltd. 520 pp. and diary. Price 2s. 6d. net. The 1920 edition of this useful and comprehensive work has been carefully revised and brought up to date with an addition of 40 pages. New features are notes on electric welding, electric furnaces, meters, &c. The wiring tables have been rearranged in accordance with the new specifications of the Engineering Standards Association.

Trade Announcements.—The Klaxon Co., Ltd., and their sister company, the O. S. Speedometer Co., Ltd., transferred their head office to 38, Blandford Street, Marylebone High Street, London, W. 1, on 24th inst. The works remain at Landor Street, Birmingham.

Messrs. Johnson & Phillips, Ltd., have removed their Cardiff branch address to 2A, Court Road, Cardiff. Telegraphic address and telephone number unchanged.

On Tuesday last, Messrs. Berkeley & Young, Ltd., returned to their old offices, Finsbury Court, Finsbury Pavement, E.C. 2 (which had been temporarily occupied by the Government). Their associated businesses, the New British Electric Supply Co., Ltd., the Enclosed Motor Co., Ltd., and B. K. B. Electric Motors, Ltd., have also returned to that address.

Messrs. Chiswell & Co. have returned to their former offices, Imperial House, Kingsway, W.C. 2, after an absence of two years, due to the requirements of the Air Ministry.

Mr. A. G. Smith has retired from the firm of A. G. & J. Smith, electrical engineers and contractors, of 122, Titchfield Street, Kilmarnock, and the business will be continued in his own name by Mr. Joseph Smith.

Mr. James Mercer has commenced business as an electrician at 44, East Trinity Road, Leith, in succession to Mr. F. C. Pentland.

Messrs. W. J. Attack & Sons have commenced business as electrical engineers at Lewknor Lodge, 11, Ellington Road, Ramsgate.

Mr. A. Berkeley has removed from Newhall Street to 111, Granville Street, Birmingham.

Messrs. Cuirass Products, Ltd., have removed to 69, Victoria Street, London, S.W. 1. Telephone number: "Victoria 5419."

Messrs. Automatic and Electric Furnaces, Ltd., have appointed Messrs. Ingenieurs-Bureau, "Econoom," Zutphen, Holland, as agents for the Wild-Barfield furnaces for the Netherlands and the Dutch East Indies.

The title of the Société des Carberies Belges, of Brussels, has been changed to that of the Belgian Electric and Rubber Works.

The German Wire-drawing Industry.—The *Economic Review* quotes a German paper, dated February 26th, to the effect that at a meeting held in Hagen i./W. some hundred firms of wire manufacturers decided to form an Association for safeguarding the interests of the consumers of rolled and drawn wire.

Plant for Sale.—Clyde Navigation Trustees invite offers for obsolete plant at Prince's Dock power station, consisting of a Bellias compound engine coupled to a Silvertown 60-KW. 250 V. D.C. compound dynamo, and a Mirrlees, Watson engine with dynamo of similar type and size, pipes, switchboards, &c.

Croydon Corporation Electricity Department has for disposal one 1,100-B.H.P. Belliss & Morcom triple-expansion engine, coupled to 750-KW. English Electric alternator and exciter, one 450-B.H.P. Belliss & Morcom tandem compound engine, coupled to G.E.C. 250-KW. alternator, surface condensing plant, and air and circulating pumps. For particulars see our advertisement pages to-day.

Auction Sale.—The Assets Auctions Co., Ltd., will sell by auction, on March 30th, at 119-21, Newington Causeway, S.E., the stock of an electrical contractor; for particulars see our advertisement pages to-day.

Translation of Catalogues.—H.M. Commercial Secretary at Santiago, Chile, points out that several catalogues of British manufactures and books of British industries printed in the Spanish language and sent to Chile have been translated into incorrect Spanish. It is a pity that firms and trade associations going to the expense of issuing publications in Spanish should try to save a few pounds by employing cheap and inefficient translators.—*Board of Trade Journal.*

Socials and Concerts.—An entertainment and dance, organised by the Ediswan Girls' Musical Society, was held on Friday and Saturday, March 12th and 13th, at Ponders End, and was largely attended by employés of the Edison Swan Electric Co., Ltd., and their friends. The affair was stage managed by Mr. D. Lishman, assisted by Mr. B. White, and the scenic effects and lighting were very effective. The Committee responsible for the arrangements consisted of Misses Jordan, E. Piggott, E. Smith, F. Boydon, M. Almond, L. Wake, V. Briggs, N. Farrell, and Mrs. Oldland. The Girls' Musical Society has only been in existence a few months; it is under the direction of Madame Carradine. One of the chief items in the programme was a musical absurdity entitled "Everything Electrical." The instrumental music was supplied by the "Ediswan" Orchestra, under the leadership of Mr. F. Dean. Miss E. Smith was accompanist.

A smoking concert of the electrical trade in Warrington, was held on Friday, March 12th, in the Pelican Hotel. Mr. F. V. L. Mathias, M.I.E.E., borough electrical engineer, presided over a representative gathering, which included among the guests Mr. W. Shaw, chairman, Manchester Branch of the Electrical Contractors' Association, and past president of the E.C.A.; Mr. R. A. Irvine, district secretary of the Electrical Trades Union; Mr. Smith, local chairman of the Electrical Trades Union; and many others. Mr. Shaw, in proposing the toast of the "Employés," stated that in his long experience of the electrical trade, the gathering was quite unique, and the first of its kind to be held in this country. They had the supply authority, the contractor, and the Trade Union, as a happy family for that evening at least. If similar gatherings could only be organised throughout the country, many labour disputes could be more amicably settled owing to the spirit of good feeling which they must create. Mr. Smith, in replying, spoke of the harmony that prevailed at the gathering, and of how much they were indebted to Mr. Robertson, of Messrs. Harry Rogers, for organising the evening, which could only bring benefit to the trade in the district. Mr. Irvine proposed the toast of "The Employers." He said that the time had come when employer and employé must pull together, or this country would be left in the lurch. Mr. C. J. B. Barlow, Warrington Electrical Co., Ltd., replied. Mr. J. B. Robertson, who subsequently spoke, said that his idea in organising the concert was the formation of a debating society on electrical subjects in Warrington. The proposition was put to the meeting and adopted, and a Committee was appointed to carry out arrangements for the formation of such a society for next winter. Other toasts followed.

A dramatic performance is taking place this week at the Metropolitan-Vickers Club, Moss Road, Stretford, where the Metropolitan-Vickers Dramatic Society are producing a musical comedy entitled "The Squire and the Devil." The production is an entirely original effort, that is to say, employés of the Metropolitan-Vickers Co. are responsible for the libretto, lyrics, musical composition, arrangement of dances, scenery, dresses, and lighting effects, besides furnishing the dramatic and musical talent. Similar performances have been given by the British Westinghouse Co. (to give the firm its old title) employés for the past 10 years, though it is only during the last three when the addition of the large new stage was made to the Club Hall that they have been presented, in the complete fashion of this latest performance. It would, therefore, seem that this annual function is in a fair way to become an institution. The parts of Squire and Devil are taken respectively by A. Cecil Busby and H. Cranfield Matthias, the principal ladies' parts being interpreted by Miss Mabel Winstanley and Kitty Shute. Miss Doris M. Walker arranged the dances. The orchestra was conducted by A. M. Parkinson, who also orchestrated the music, which was composed by G. H. Rowlands, and Maurice Hird wrote the lyrics and libretto, additional lyrics being written by Alec. J. Crawford, who also took a part on the stage.

A new social club for the employés of the Bradford Corporation tramways department was opened on March 17th, at 4, Leeds Road, by the Lord Mayor of Bradford (Alderman Wm. Wade), Mr. R. H. Wilkinson (tramways manager) presiding.

Electric Heating Plugs for Chicago.—According to a report received from H.M. Consul-General at Chicago, a firm in that city invites particulars of attachment plugs for electric heating appliances; many millions could be sold. The name and address, &c., of the firm can be obtained, and samples seen, at Room 49, at the Department of Overseas Trade, 35, Old Queen Street, S.W. 1, until April 7th, after which they will be available for inspection in the provinces.

Payment by Results.—A very important decision was arrived at on Thursday, last week, at a conference of the National Federation of General Workers, which has a membership of about 1½ million workers, a large proportion of whom are employed in engineering workshops. The conference decided to adopt the principle of "payment by results" in the engineering and shipbuilding industries. The engineering Unions are balloting on the same question, but their decision will not be known until the end of April. Should this principle be generally adopted, a large increase in output may safely be counted upon, together with a corresponding increase in the wages earned by the employés.

Mr. W. T. Kelly, of the Workers' Union, says that the question of payment by results was considered from the point of view of industry generally, and not merely as affecting the engineering trades. The various Unions had decided that payment by results was a form of payment they could well agree with, and that the safeguards they intended to attach to it—as in the engineering trades—would enable the system to be brought into operation with more beneficial results than the present time-rate method of payment.—*Daily Telegraph.*

Catalogues and Lists.—Automatic and Electric Furnaces, Ltd., 281-283, Gray's Inn Road, W.C. 1.—An illustrated leaflet showing two types of electric drying ovens.

The Klaxon Co., Ltd., 1, King Street, St. James's, S.W.—Three priced and illustrated pamphlets dealing with "Klaxon" warning signals and motor horns.

The Greengate and Irwell Rubber Co., Ltd.—A well-produced catalogue (68 pp.) of Association, non-Association, and cab-tire sheathed rubber-insulated cables and wires.

Pontelec Welding Patents, Ltd., 46, Constitution Hill, Birmingham.—A list, illustrated by photographs, of electric spot and butt welding machines, with reports on various tests carried out by them.

Messrs. A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlet No. 335, dealing with new horizontal telephone-cable dividing boxes.

The General Electric Co., Ltd., 67, Queen Victoria Street, E.C. 4.—Pamphlet K 2,295, dealing with telephone brackets.

Sterling Telephone and Electric Co., Ltd., Telephone House, 210-212, Tottenham Court Road, W. 1.—Bell Catalogue No. 276 (24 pp.), a comprehensive list of bells and buzzers and accessories, including accumulators, dry cells, indicators, &c. Fully priced and illustrated.

Mr. C. F. Elwell, Craven House, Kingsway, W.C. 2.—"Continuous Wave Installations" (22 pp.). Printed on art paper and profusely illustrated by photographs, this publication describes the advantages of the Poulsen continuous-wave arc system of wireless telegraphy, showing generators, controls, and instruments. Incorporated in the volume is a data form for the use of prospective clients.

Messrs. Ward & Goldstone, Ltd., Sampson Works, Salford, Manchester.—Illustrated pamphlet dealing with the "T.R.S." (tough rubber sheathed) wiring system, wires, and accessories.

The British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames Street, E.C. 4.—List No. 10,336B. A profusely illustrated catalogue (30 pp.) showing the application of "Mazdalux" metal reflectors to industrial lighting. Prices and data are given.

Messrs. Drake & Gorham Wholesale, Ltd., 67, Long Acre, W.C. 2.—Pamphlet No. 280. The "Hoadley" current limiter. Priced and illustrated.

Liquidations and Dissolutions.—Telephos Domestic and Street Lighting Co., Ltd.—Winding up voluntarily for reconstruction purposes. Liquidator, Mr. H. H. Foster 805/9, Salisbury House, London Wall, E.C.

Trafford Power and Light Supply (1902), Ltd.—Meeting of creditors called for to-day at 60/62, Spring Gardens, Manchester.

Pollock & Macnab, Ltd.—Meeting April 23rd, to hear an account of the winding-up.

Quain Electric Co., Ltd.—Mr. C. W. Rooke, of 2 and 3, Norfolk Street, Strand, W.C. 2, has been appointed receiver and manager for the debenture holders, under an order of the Court dated March 12th.

D. O. Williams & Co., electrical engineers and contractors, High Street, Clydach-on-Tawe, Swansea Valley.—Messrs. H. D. Roberts, B. H. Davies, and J. T. Davies, have dissolved partnership. Messrs. B. H. and J. T. Davies will attend to debts and continue the business.

The Electric and Engineering Specialities Co., electrical manufacturers and factors, 79, Great George Street, Liverpool.—Mr. B. L. Myer and Mr. W. Fraser have dissolved partnership. Debts will be attended to by Mr. T. E. A. Killip, of 21, Tempest Hey, Liverpool.

Co-operative Shareholding in Engineering Trade.—The Joint Committee appointed to investigate the economic relation of production to hours of work in the shipbuilding and engineering industries has now been constituted. It was stated last week that both the shipbuilding and engineering employers were prepared to announce to their workmen, as soon as the Committee's decision on payment by results was made known, a large scheme of co-operative shareholdings.—*Birmingham Post.*

Rotary Snap Switches.—In order to avoid confusion, The Hart Manufacturing Co., of Hartford, Conn., U.S.A., ask us to announce that they have not appointed any company or firm their agents; and that the "Diamond H" switches and other appliances are imported solely into England by their London office at 76 and 77, Rochester Row, Westminster, S.W. 1.

Sparking Plugs for Japan.—Official intimation has been received in London concerning an immediate demand in Japan for aero engine sparking plugs. They are required by a Japanese company who are building aero engines for the Japanese Government, whose name and address may be obtained from the Department of Overseas Trade, 35, Old Queen Street, S.W. 1.

Apparatus Wanted for Hong-Kong.—The D.O.T. reports that the following apparatus is required for the Royal Observatory at Hong-Kong:—Electrical clocks, magnetic, astronomical, meteorological, and electrical apparatus. Catalogues with prices of such apparatus should be sent to the Director, Royal Observatory, Hong-Kong.

Patents and Designs Act, 1919.—The Board of Trade has ordered that Sections 1 and 2 of the Patents and Designs Act, 1919, shall come into operation on April 1st, 1920.

Electric Lamp Manufacturer: A Tribunal Decision.—The Manchester Munitions Tribunal has occupied two days in an inquiry whether a firm manufacturing miners' electric lamps is entitled to employ female labour in the production of certain parts. The Amalgamated Society of Engineers contended that prior to the war the work was done by male labour, and that women were introduced in 1916 as an emergency measure. By not reverting to the pre-war practice the employers were infringing the Restoration of Pre-war Practices Act. The employers urged that before 1915 or 1914 the manufacture of miners' electric lamps was practically in the experimental stage in this country, the bulk of the supplies coming from Germany. Efforts, more or less successful, had been made to produce a British article, and though male labour was employed during the experimental stage it had become customary to have minor parts done by women. The work was largely of a repetition character, and analogous to that done by women in the electrical fittings industry.

Mr. J. W. H. Graham (chairman of the Tribunal) had the assistance of two assessors, one of whom dissented from his decision, which was given on March 19th. He said there was very substantial evidence that women, although not in large numbers, were engaged in Manchester, Birmingham, and other places on similar work, which came within the electrical branch of engineering. The society had failed to establish any practice or custom not to employ women in the manufacture of the lamp. Apart from that he was of opinion that in this case the making of miners' electric lamps must be regarded as a new industry.

German Commercial Propaganda.—H.M. Consul-General at New York says that Germany is making serious efforts to regain her foreign markets, as is shown by the tremendous advertising campaign being organised by the Reichsverband Deutscher Industrieller (Society of German Engineers).

The National Foreign Trade Council has received the information that under the management of the "Ala" (Allgemeine Anzeiger Gesellschaft m.b.H.), a notorious propaganda centre of German war industry, foreign countries are to be flooded with German periodicals. A manufacturers' export paper, published in four languages—German, English, French, and Spanish—is now being published. Engineering concerns are subscribing heavily to this enterprise in the shape of advertising contracts, and prepaid subscriptions for a large foreign circulation during a period of five years. Individual firms like Krupp's have contracted to pay the fees for over 3,000 free copies to be sent out regularly during that period. Further, a combine or trust of the German industrial Press is in the course of formation with a view to making concerted efforts in the same direction.

The "Ala" intends to establish officers in all foreign capitals to act as advertising agencies and as distributing centres and news gatherers for the Uberseedienst (Overseas Service), a large German agency for commercial news affiliated with the "Ala." In the former capacity it is hoped to wield much influence in the foreign Press and trade periodicals.

Copies of *Uberese-Post*, published first in October, 1919, to which this report probably refers, may be seen in the library of the Department of Overseas Trade, 35, Old Queen Street, S.W. 1.

Trade Opportunities in Mexico.—American manufacturers are hopeful of retaining the trade with Mexico which has come to them as the result of European disability to compete. They have been warned, however, to improve their methods of packing, and be prepared to give quicker deliveries than they have done of late. In reporting on the market for electrical installations in the State of Vera Cruz, the American Consul points out that the district is largely agricultural. Conditions at present are not favourable to the development of lighting plants or to the sale of electrical machinery for manufacturing plants, &c. However, a few of the larger and better protected sugar plantations are large users of electrical materials, all such purchases being made, usually, before the grinding season, which commences about the middle of December. Catalogues and price lists should be sent to the sugar planters. The literature should be in English and Spanish, as many of these plantations are owned by Americans and managed by natives, and the native managers are frequently not familiar with the English language. In Orizaba, State of Vera Cruz, where there is considerable manufacturing, electric power is largely used; some of the factories generate their own electricity, as in the case of the Companía Industrial de Orizaba, S.A., which has a model hydroelectric plant at the cascades of Rincon Grande, near Orizaba, and another at the Cocolapam factory.

The power used is over 8,000 H.P., and there are 18 turbines and four electric motors. Under more favourable conditions there is every reason to expect an even larger use of electricity in the Orizaba neighbourhood, and an increased demand for lighting plants in many of the smaller towns.

There is a good market for all kinds of modern electrical material and household appliances, and during the long hot season, especially, for electric fans, of both overhead and desk types, which are found in many homes and offices. Although the local people are somewhat slow to adopt modern inventions, particularly in the home, there is an increasing interest in electric irons, toasters, and ovens—the latter being especially desirable, as many of the best homes have only charcoal braziers for cooking. When the political unrest subsides there should be excellent scope for widening the sale of house installation material in Vera Cruz, Orizaba, and Jalapa.

Tampico, Mexico, is considered by the American Consul to offer good opportunities for the sale of small electrical material. This is due to the general progress brought about by the exploitation of the oil wells in the district, and in particular to extension of building operations. The housing problem has been one of the city's foremost concerns during the past year, and naturally the question of fittings has received attention. Electrical installation, wiring fixtures, electric pumps for supplying water, &c., have been factors occasioning delay in the fulfilment of building contracts. Doubtless the placing of an agency in the hands of a contracting engineer would result in the securing of much business, particularly since the oil drilling appears to be forever finding new locations, thereby necessitating new housing construction and equipment.

Engineering Amalgamations and Specialisation.—Speaking at the recent annual meeting of Crossley Bros., Ltd., Mr. J. J. Carter, the managing director, regarded amalgamations in the engineering trade with favour. He said it must be realised that, with constantly increasing costs of production, the only way the progressive manufacturer could expect to deserve a share of the world's markets was to limit the range of manufactures and greatly to increase the production of the reduced range of types. That was what his firm was doing. Specialising in internal-combustion engines ranging from 3 B.H.P. to several thousands of H.P., it was impossible to build that enormous range in one factory under economical conditions. They had, therefore, decided to divide the range between the several works, and had acquired the business of the Premier Gas Engine Co., Ltd., Nottingham. At Nottingham it was the company's intention to build engines from 300 to 3,000 B.H.P. Extensions of the works were in hand which, when completed, would treble the output of the Premier works. At the Openshaw works engines with five sizes of cylinders would be built instead of 25 sizes, as was the case before the war, but the production of those five sizes alone would be at least double the whole pre-war production. At the Erwood Park works, near Stockport, engines from 3 to 30 B.H.P. would be built on mass production lines.—*Machinery Market.*

Liverpool Dispute Settled.—Our correspondent writes: "As foreshadowed in the last issue of the ELECTRICAL REVIEW, the lock-out in the Liverpool electrical contracting industry terminated last week, and on Thursday there was a general return to work, on the mutual understanding that there would be no victimisation on either side. Thus is ended one of the most stubbornly-fought of recent disputes in the electrical trade, and reviewing the whole circumstances, both before and since drastic action was resorted to, there cannot be much doubt in the assertion that the employers have not emerged from the struggle with flying colours. So far from this being the case, by agreeing to the intervention of a conciliator for an award on a wages question, which first saw light of day when the lock-out had been in progress six or seven weeks, they are obliged now to pay increases in wages which total 6s. 10d. per week to the electricians they employ. All that they have obtained in return are a few modifications in rules, which might have been obtained much sooner than they were, had the position been clarified in the way that it eventually was by both sides discussing their grievances at a round-table conference. From what the writer has been able to gather, but for the support given the Electrical Trades Union members by their outside branches, and other work on ships being opportunely available, a much earlier return to work would have been inevitable."

The settlement of the lock-out was celebrated by a dinner given at the Bee Hotel, Liverpool, which was attended by both electrical contractors and manufacturers. Mr. A. E. Chesters presided.

Proposing "The Allied Electrical Trades," Mr. J. E. Lloyd Barnes observed that if Labour could only be persuaded to put its shoulder to the wheel and give a fair return for the wage now being paid, great progress would be made in the industry. Too often employers had made the mistake of leaving issues to be decided in a haphazard manner. Mr. G. A. Sutton, who replied, observed that in the Liverpool electrical industry there would never be such a good understanding as now, and petty troubles between manufacturers and contractors had been swept away. Greater prosperity might be looked for in the Liverpool industry, said Mr. J. Dennis. Numerous developments were taking place, and there was the probability of a large super-station being erected in the Garston area, in which case electricity would in many cases supersede steam.

Mr. G. Barnes, replying to the toast "Our Guests," made reference to the formation of the Consultative Committee of the Liverpool employers. The battledore and shuttlecock game which the trade unions were able to play on employers was a very serious matter, and this could not be helped unless all employers were brought closer together. Before they could hope to stop the increasing wages, they must find ways and means of decreasing the cost of living.

Alleged Profiteering in Lamps.—Our Leeds correspondent writes: "Interviews with members of various branches of the electrical trade here elicited a good deal of opinion that the margin of profit on electric lamps has not been unreasonably large, in view of all the conditions of production and distribution. The big percentage of breakages has to be allowed for, and the trade generally appreciates the custom of replacing defective lamps. A Leeds representative of the associated producing undertakings mentioned by the committee report says none of the firms have ever declared a dividend of more than 10 per cent., and he says a comparison of lamp prices during the past 20 years shows that there is no unjustified increase. He points out the great cheapening of the various half-watt lamps in general household and commercial use, due to their manufacture in this country now, as against their previous general importation. Another trader said it was only fair to the British producers to draw attention to their enterprise, which had captured the lamp trade from the Austrians. On the other hand, traders not associated with the activities of the Electric Lamp Manufacturers' Association contend that the 'ring' has practised methods which had the object of crushing those outside. One such trader, however, frankly admitted that he did not believe the 'ring' had forced up prices in the manner suggested in the report, and did not think traders would ever be able to sell lamps at 2s., in view of the increasing cost of labour, materials, and transport. All kinds of manufacturing and distributing charges had advanced so greatly that he could not think any producer could have made an excessive fortune. This trader held that the Association certainly had too much control over the trade, and he blamed the Board of Trade for having allowed it so long. The activities of the Association had a tendency, in certain ways, to the restriction of trade."

Overseas Touring Exhibitions.—As already announced the Department of Overseas Trade is organising a number of touring exhibitions of British manufactured goods, which will visit the principal commercial centres in the British Dominions, South America, the Far East, and the United States of America respectively. At present four touring exhibitions are contemplated. The first, the preparations for which are most advanced, will make a tour of the British Dominions. It is anticipated that it will leave England in June next, visiting the chief cities in South Africa, Australia, New Zealand, and Canada, and returning about July, 1922. The other three tours which are under contemplation will visit the principal commercial centres in South America, the Far East, and the United States of America respectively. It is estimated that the displays will be on view for about a fortnight in each city. The exhibits will be packed, carried, and displayed in specially designed show cases and packing cases, which will remain the property of the firms. The scheme is self-supporting, and it is anticipated that on a basis of 500 exhibitors each tour will cost from £200 to £250 (excluding the cost of show and packing cases) per unit of space. Firms may apply for a half unit, or for one or more units, and there are five different types of show cases adapted to the varying requirements of particular trades.

It is hoped that the three tours to foreign countries will leave England during the last few months of this year. The Far Eastern tour will include in its itinerary some of the chief commercial centres in India, Siam, the Straits Settlements, Dutch East Indies, China, and Japan, and possibly Egypt, the complete journey occupying about two years. The South American tour will leave the United Kingdom in the late summer or early autumn, visiting probably Lima, Santiago, Buenos Aires, and Rio de Janeiro; and the U.S.A. tour will go to New York, Philadelphia, Atlanta, St. Louis, Chicago, and San Francisco. British firms who are interested in any or all of these tours are advised to make early application for an allotment of space, as the total number of units in each tour will be limited to 500. For the Dominions tour only applications received not later than March 31st can be guaranteed consideration. A pamphlet containing full particulars of the four tours, with provisional application forms for space units, may be obtained by interested firms from the headquarters of the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1, where specimens of the special types of standard show cases to be used on the tours are on view. Inquiries are invited from interested firms on any specific points not dealt with in the pamphlet.

Help for Disabled Men.—Probably the longest "honours list" that has ever been published is the recently issued "King's National Roll," which gives the names of about 10,000 employers who, up to the end of last year, had undertaken to show their appreciation and gratitude to those who were maimed in their country's service by giving them employment.

The scheme, which is quite a simple matter of arrangement between employers and the Labour Exchanges, has met with marked success, and practically every branch of industry and commerce is represented in the list. Although the scheme applies to unskilled men, in the main, it is hoped that employers will eventually train them to enable them to be put on the same level of earning capacity as their more fortunate brethren. It is to be remembered that a great number of these disabled men joined the forces to the detriment of their civil careers—training in many cases being abruptly broken off, but there is no doubt that a little care and consideration will help them to become useful citizens, and, moreover, will make them feel that the country they fought for has not forgotten its enormous debt to them. Many big firms and municipal authorities have resolved that contracts shall only be placed with people who have undertaken this obligation, and although this will act as an incentive to employers to enrol themselves under the scheme, it is to be hoped that this will not become the main reason for participation in the scheme.

The notes accompanying the list state that there are still thousands of wounded men unable to find employment, and so it is to be hoped that the scheme will be kept prominently before the public until the great debt is settled.

LIGHTING AND POWER NOTES.

Aldershot.—Proposed Extensions.—The Urban District Council has applied for a loan of £21,550 for additional plant and extensions to the buildings at the electricity works.

Australia.—Government Supply Undertaking.—The report upon the Western Australian Government's supply undertaking for the year ended June 30th, 1919, records a net loss of £120, against a deficit of £5,250 for the previous period.

Barnes.—Extensions Approved.—The Urban District Council has been informed by the Electricity Commissioners that it can proceed to make contracts for generating plant, transformers, converters, &c., needed for extensions at the electricity works. The Council has decided to pay an extra £1 per year for each public electric lamp, making the cost £4 15s., and to increase the supply of electricity to Messrs. Watney, Combe, Reid & Co. from a maximum of 300 KW. to 400 KW., with the right for the firm to require a further supply of 400 KW.

Beckenham.—Price Increase.—In order to recoup the deficit resulting from the last nine months' working, the Council is increasing its charges to consumers as from April 1st. The price for lighting is to be raised from 8d. to 10d. per unit, and for heating from 2d. to 2½d. Special contracts will probably be revised. The new charges are expected to increase the revenue by £4,350.

Bo'ness.—Proposed Extensions.—The Town Council is considering the need for further extension of the electricity works, and the desirability of taking the management of the undertaking into its own hands at the next determining period. The capital sum borrowed up to the present is £49,000. An expert is to be called in to report on the proposed extension.

Bexhill.—Cable Extension.—The electrical engineer's scheme for the construction of new feeder cable contemplated the carrying of the cable for some distance along the L.B. and S.C. Railway embankment, thereby effecting a considerable saving in expenditure as against completing the whole length by means of highway excavation. The railway company will raise no objection, subject to a satisfactory agreement being entered into, to the feeder being laid along the railway line from the electricity works to Sea Road Bridge only. The engineer has submitted a revised estimate of cost of extension covering this route, which amounts to £4,600, and has been adopted.

Bradford.—Strike Threat.—Owing to one of the employés at the Corporation electricity works refusing to join a Trade Union, the remainder of the workmen sent in a strike notice to take effect on Saturday, March 20th, but as the result of overtures from the Corporation, it was decided to place the matter before a joint consultative board of representatives of the Corporation and the Trade Unions on the 22nd, and the threat to strike was accordingly withdrawn.

Bristol.—Parliamentary Bill.—In view of the establishment of the Electricity Commission and the opposition encountered by the Corporation's Bill, it has been decided that, if expedient, any or all of the electrical clauses shall be withdrawn.

Burnley.—Estimate.—The estimated profit on the electricity works for the year is £2,991, which is increased by £935 brought forward. It is proposed to transfer £2,000 to the rates, and place £1,926 to reserve. Reserve and depreciation funds now stand at £26,673.

Continental.—France.—The Energie de Seine-et-Yonne has applied for sanction to the erection of a 20,000-volt overhead transmission line to supply power from Epicy to the pumping station of the Eaux de Sorques, belonging to the City of Paris.

The Conseil Général du Bouches du Rhone has decided to establish a hydroelectric station to generate power for public and private lighting and electric traction. A concession is to be asked for from the State of a waterfall on the Durance River, between Cadenel and Pertuis. Plans for the whole scheme are in course of preparation.

The Municipal Council of Issoire (Puy-de-Dôme) has transferred the concession for the supply of electricity from the Compagnie du Gaz d'Issoire to the Société Hydro-electrique de Clermont.

The Société des Forges et Aciéries Paul Girod, of Ugine, is building a hydro-electric station at the Beaufort Fall, 270 metres high, on the Dorinet River. A second fall, 240 metres high, at Belleville, will next be taken in hand.

Gas and electric light have now to be shut off at 8 p.m. in all shops at Lille, owing to the coal strike, and cafés and restaurants must close at 9 p.m.—*Paris Daily Mail.*

The "Super Central of Gennevilliers," outlined in the programme of the Union d'Electricité, which is in replacement of the older works of the several Paris companies with which it has amalgamated, will have a capacity of 200,000 KW., raised eventually to 300,000 KW. The turbines, each of 35,000 KW., are on order with the Société Alsacienne, Schneider & Escher-Wyss. One line, at 60,000 volts, will be allocated to serve the Paris district, and several important communities, such as Creil, Meaux, Mantes and Corbeil. The Union will now be able to furnish, with the help of the suburban secteurs associated (Ouest-Lumière, Est-Lumière, Triphasé, Secteur de la Rive Gauche) 700,000,000 KW.-hours per year. An offshoot society, just constituted, is the Société Hydro-Electrique du Sud-Est.

The Chamber of Commerce of Nancy is making a comprehensive study of a project for utilising the water power of the Rhine, by which electric power could be generated and distributed throughout the greater part of Eastern France.—*Financier.*

ITALY.—Application has been made to the Ministry of Public Works on behalf of the firm of Carls Mosca for a concession for a hydro-electric scheme, estimated to cost 120,000,000 lire. The plans propose the utilisation of the torrents of the Valcellina and of the River Cellino, yielding an aggregate force of 41,087 H.P., to be employed in the electrochemical industry. Three falls are to be worked, that of Lesis, 195 metres; the Cellino, 134 metres, and the Barcis, 103 metres.

The Società per le Forze Idrauliche della Sila has under consideration a number of mountain storage reservoirs for impounding the waters of the rivers Arvo, Ampollino, and Noto, capable of generating together 150,000 KW. The electricity will be used not only in Calabria, but in Puglie, Campania, and also possibly so far off as Sicily. One reservoir alone, now under construction, will have a capacity of 61,000,000 cb. metres, drawn from the Ampollino. The reservoir wall will have a height of 29 metres, and the plant installed will develop 496,660 H.P.

SWEDEN.—The managers of the Stockholm Municipal Supply Works state that, as a result of the increasing demand for energy, it is necessary to make provision for the erection of new works, and for this purpose they have entered into a provisional agreement for the acquisition of all the shares in the A. B. Svarthalsforsen, at the price of 2,250,000 kr. This company's waterfall, which is situated between Hammarfossen and Stadsforsen, is 263 miles distant from Stockholm, and is capable of yielding considerably greater power than the Untra works, from which power is already transmitted to the Stockholm works. It is calculated that the fall will be able to deliver 60,000 H.P., and a pressure of 200,000 volts will be necessary for the transmission, as compared with 100,000 volts in the case of the Untra works. It is considered desirable, however, for economic reasons, for a still larger quantity of energy to be directly transmitted to Stockholm than that represented by the capacity of the Svarthalsfors, and the question arises as to the acquisition of other water powers for the possible further needs of Stockholm. As as alternative, it is suggested that the municipal authorities might co-operate in the transmission of power with the State's hydro-electric works at Stadsforsen, or with the Krangede works.

BELGIUM.—A Royal Decree has recently been issued, under which companies and firms holding concessions for the public supply of electricity, are authorised to increase their charges to the extent of 50 centimes per KW.-hour, so long as the advance does not increase the charge to more than 1 fr. per KW.-hour. The Decree supersedes any condition as to the price to be charged to consumers that may have been agreed upon between the authority or authorities, granting the concession and the concessionnaires.

Cupar (Fife).—TOWN LIGHTING.—With regard to the proposed installation of electrical plant for the town, the Fife Electric Power Co. has pointed out that its powers to supply electricity in all parts of the county are still in force, and accordingly the Council can only obtain powers by means of a special order by the Electricity Commissioners. In view of this, the Council is considering the question of taking a bulk supply from the Fife Electric Power Co.

Dublin.—STREET LIGHTING.—In reply to a letter from the Citizens' Association, the town clerk states that there has been no appreciable saving consequent upon the Corporation's decision to cut off all public lighting at 11.30 p.m., as the plant had to be kept running as usual.

Dundee.—LIGHTING CHARGES.—The new flat-rate proposals recently formulated by the electricity department are meeting with great opposition from tradespeople. The new terms are £1 per annum per 100 sq. ft. of space plus ½d. per unit plus 15 per cent., and are considered unnecessarily involved, and apt to work unfairly.

Glasgow.—SUB-STATIONS.—The Town Council has received permission to erect sub-stations at Cathedral Street and Mauldslie Street, Partick.

Halifax.—REPAIRS.—In consequence of repairs being effected to the condensing plant at the electricity works, the supply of electricity was cut off from daylight till 2 p.m. on March 28th.

High Wycombe.—PROPOSED PRICE INCREASE.—The Electric Light and Power Co., Ltd., is seeking to advance the price of electricity for lighting as from the quarter ending June next to 10d. per unit.

Hull.—EXTENSIONS.—Preliminary sanction has been given to the Electricity Committee's scheme of extensions, which involves an expenditure of £143,125. In his letter, Sir John Snell said that he was prepared to advise the Corporation to let the necessary and more urgent contracts, and he would advise the Commissioners to sanction the proposed loan in due course. He could not say whether it would be necessary to hold an inquiry, but, owing to the isolation of Hull, it was not likely to be affected by any district scheme for many years to come. The Committee decided to proceed with the scheme as speedily as possible. To meet the position caused by the 10s. reduction in the price of coal, it was agreed, pending actual experience, to make an allowance to consumers at the rate of 0·3d. per unit sold, the same to be deducted in a lump sum at the end of the March quarter, the allowance to be adjusted as deemed necessary, from time to time.

Liverpool.—ISSUE OF STOCK.—Of the £4,000,000 being raised by the creation of 6 per cent. City stock, £1,000,000 is required for electrical developments and extensions, and £300,000 for the tramways.

ADDITIONS.—Arrangements have been made for contractors to carry out building works, &c., at five power sub-stations.

London.—HACKNEY.—The Electricity Commissioners have notified the London County Council that they raise no objection to the sanctioning of a loan of £305,580 for electrical extensions as they are of opinion that such extensions are necessary. The London County Council concurs, but requires the Borough Council to account for outstanding balances on loans raised for the purchase of any of the present plant that may be displaced.

Lymington.—PUBLIC LIGHTING.—The Town Council has accepted the tender of the Electric Light Co. for public lighting at £429 per annum.

Stockton Heath.—ELECTRICITY SUPPLY UNAVAILABLE.—The Council has been informed that Warrington Town Council is not in a position to supply electricity to the parish, as the Warrington undertaking cannot meet the requirements of local manufacturers.

Tullamore.—ELECTRICITY SUPPLY.—Prominent business people are forming a company to provide electricity for power and lighting for the town. The estimated cost of the project is £12,000.

TRAMWAY AND RAILWAY NOTES.

Australia.—YEAR'S WORKING.—A net loss of £4,046 was the result of the working of Western Australian tramways during the year ended June 30th, 1919. This deficit, it is stated, is due in the main to a strike which commenced on December 21st, 1918, and was not settled until February 7th, 1919, causing an estimated loss to the system of £21,000. The influenza epidemic was also responsible in part, the loss from this cause being £600.

Blackburn.—LECTURES.—An interesting lecture was given to the Corporation tramway employés on March 18th, by Mr. W. Willets, armature winder to the department, on the "Electrical Equipment of Tramcars." He gave full details of the many minor faults which could be rectified by the men themselves, and fully explained the uses and abuses of the electric brake, pointing out the damage caused to the equipment by the frequent use of this emergency brake. There were about 60 employés present, also the manager, and other officials. Mr. Cowell, the manager, in proposing a vote of thanks to the lecturer, pointed out that if the men followed the instructions given by Mr. Willets, a great saving would be brought about both in reducing the quantity of energy consumed, and in lessening the expense of repairs. The lecture was repeated on Thursday, the 25th, for the benefit of those employés who were unable to attend owing to being on duty. The management is also arranging for two lectures to be given to the conductors by Chief Inspector Riley on "How to Become Efficient in your Duties."

Brazil.—RAILWAY ELECTRIFICATION.—A contract has been concluded between the Cia. Paulista and the Empreza Electrica de Jundiahy and the S. Paulo Electric, in connection with the electrification of the lines of the Cia. Paulista. The value of the contract is 3,025 contos, and its duration 10 years, renewable for a further similar period. The minimum supply of electric power is to be 8,400,000 KW.-hours, which may be raised to 20 million when the company decides on the electrification of all its lines. The first section to be converted is that between Jundiahy and Campinas.—*Board of Trade Journal.*

Burnley.—Estimated Loss.—There is not expected to be any balance on the working of tramway department, either for profit or renewals. The estimates for the coming year show a loss of £3,417, without any provision for renewals, and a revision of fares will have to be reconsidered at an early date.

Continental.—Austria.—The Austrian State Railway Administration has drawn up a five years' electrification programme, for the realisation of which foreign capital will be enlisted. According to the *Neue Freie Pr.*, the Steniach-Irdning-Attnang-Puchheim line is to be supplied with energy from the power station of Stern and Hasserl, in Gosau; the Innsbruck-Bludenz line from a power station in course of construction on the Spullersee. The Ruetz Works at Innsbruck, now supplying the Mittenwaldbahn, are to be extended so as to supply the eastern portion of the Arlberg railway. The Salzburg-Schwarzach-St. Veit line is the next one to be dealt with, and a power station of its own will be erected in the Stuppachtal. Experts at present are engaged in discussing ways and means for this scheme, and in determining financial preliminaries.—*Economic Review.*

Sweden.—The Narvik Railway, which carries iron ore from Sweden to the ice-free harbour in Norway for transhipment to England, has been electrically worked for some years on the Swedish side—that is, from the ore deposits to the Norwegian border. Electrification of the line from Lulea to Narvik is, however, in progress, and it is expected that the line will be completely electrified by the commencement of 1922. A further portion of the Swedish line as far as Gällivara will be ready by the end of the current year, but further extensions, requiring about £950,000, are awaiting the sanction of the Swedish Parliament. The Norwegian portion is expected to be fully electrified by the end of 1921.—*Iron and Coal Trades Review.*

The Railway Administration in Sweden has handed the Government its estimates and plans for the electrification of the Swedish railways. The Stockholm-Gothenburg Railway will be first taken in hand, and its electrification is expected to cost Kr. 65 mill. The electric power will be obtained from the Trollhättan and Matala falls; the Jaerna-Norköpping and the Patternholm-Malmö lines are also to be electrified.—*Economic Review.*

France.—An extension of the departmental railways is contemplated by the Conseil Général of the Bouches du Rhone. It is proposed to build a new line to link Salon with Marseilles, passing through Roquefavour, Le Realtor, Peuves, Saint-Antoine and Aygalades. Avignon will be linked with Châteaurenard-Provence and Eyguières with Orgon. The line will be electrically worked, and the power supplied by the central station at Meyrargues, on the River Durance.

Italy.—A scheme, mooted at the beginning of the war, for an electric tramway network to open up the valley of the Cesano has been revived and extended by Signor Romano Andreoli, who has applied for a concession. The new line proposes to start from the Adriatic coast at the mouth of the Marotta and run as far as the city of Pergola, continuing thence to Fabriano-Urbino. A branch is to be built out to the sulphur mines at Bellisio, and another along the coast as far as Fano and Senigallia.

Glasgow.—Employes' Deputation.—A deputation of the National Amalgamated Workers' Union (M.E.A.) was recently received by the Tramway Committee. The object of the deputation was to urge the Council to find other employment for motormen and conductors who had been certified as medically unfit for their duties. The manager stated that only 20 out of a total of 1,423 men examined had proved physically unfit, and an endeavour was being made to provide them with suitable employment in the department. The deputation urged, in addition, that previous service should be taken into account when these men were placed in new positions.

Leeds.—Proposed Fare Increase.—The Tramways Committee has recommended the adoption of the full statutory limit of 1d. per mile. One mile-stages will be charged for at the present rate, there will be a ½d. increase for 2 and 3 miles, 1d. on 4 miles, and 1½d. on 6.

London.—Accidents.—Official figures published this week show that nearly 60 persons were killed or injured in the London streets every day during the past year. The actual figures for the Metropolitan Police District were:—Killed 687, injured 18,998, a total of 19,685. The casualties were caused as follows:—Tramcars, killed 41, injured 2,906; omnibuses, killed 136, injured 1,953; other vehicles, killed 510, injured 14,139.

Milnrow.—Suggested Railway Electrification.—The District Council has been in communication with the Lancashire and Yorkshire Railway Co., suggesting the advisability of extending the electrification of the line from Manchester to Oldham and Shaw onward to Rochdale. The company has replied that the suggestion is being considered.

New Zealand.—Tramway Extensions.—The Department of Overseas Trade states that the following loan proposal has been carried:—Wanganui: £140,000 for tramways, plant, and extensions. Particulars regarding this loan, and the sums allocated, are as follows:—For extension to the existing tramway, £36,310; for construction and erection of buildings and sheds, alterations and improvements to existing buildings, supplying machinery, plant, tools, apparatus, and appliances for generating power by steam, hydro-electric, gas or other approved motive power in connection with the tramways and the supply of electric power and light to private consumers, £56,053; for constructing, providing, and supplying electric tramcars, trailer-cars, trucks, motors, equipment, and appliances, £19,551; for constructing, making, supplying and providing poles, cables, sub-stations, transformers, meters, and all other material, plant or appliances necessary, £28,086. Tenders will be called for the supply and erection of all machinery and plant, and for the materials necessary for the track and overhead equipment. Orders have already been placed for car and trailer bodies and the necessary equipment.

Pontypridd.—Accident.—Several persons were injured through the overturning of a car after a backward run of half-a-mile down a steep incline. Three vehicles were collided with during the run.

TELEGRAPH AND TELEPHONE NOTES.

Austria.—It is proposed to double the postal, telegraph, and telephone rates.

Belgian Congo.—There is a complete system of wireless telegraphy between Banana and the coast, and between Boma, Kinshasa, Coquilhatville, Basankusu, Umangi, Basoko, Stanleyville, Kindu, Kongolo, Albertville, Kikondja, Elizabethville, Lusambo, and Kilo. It is proposed to construct an intercontinental station to connect the Colony with Belgium, and to strengthen the stations at Benna, Coquithatville, and Elizabethville.—*Board of Trade Journal.*

Continental Telephone Charges.—The Postmaster-General gives notice that from March 22nd the charges for telephonic communication between the United Kingdom and France, and between England and Wales and Belgium, have been fixed according to a schedule in the *London Gazette* of March 19th, and now vary from 6s. to 12s. 10d. for a three-minute conversation with France according to the zone in which the call originates. The charges for calls between 9 p.m. and 7 a.m. are three-fifths of the charges during the day time. The charge for a three-minute conversation with Belgium is 8s. In the case of a call to or from a call office, a fee of 6d. for a period of three minutes, and 1s. for six minutes is payable, in addition to the above charges.

Finland.—The receipts of the Finnish Telegraph Office in 1919 amounted to F.Mk. 10,519,164, and the expenses to F.Mk.6,517,181, giving a surplus of F.Mk.4,001,983. The number of foreign telegrams dealt with was 739,904, as against 231,423 in the previous year. Corresponding figures for internal telegrams are 325,825 and 253,490 respectively. According to *Uusi Suomi*, a project is on foot for inter-State telephone connection between Finland and Sweden. It is suggested that a line should be opened between Uleaborg and Torneaa.—*Economic Review.*

Naval Wireless Stations.—The Admiralty announces that officers in charge of tropical wireless stations will be appointed normally for a period of one year, and those in charge of non-tropical stations for two years. Officers appointed in charge of stations coming under either category will be allowed the option of an extension of their appointment up to a maximum of three years. An appointment of two years' duration entitles its holder to repayment of half the cost of passage of his wife and family, but the privilege of free passages for wives and families is restricted to officers holding appointments the duration of which is five years or upwards. In the new Navy Estimates, under the Works Vote, a sum of £12,400 is taken for the provision of living accommodation at the wireless stations at Bathurst (West Africa), Demerara, and Jamaica. The new quarters for the staff at the first-named station will cost altogether £16,800, of which £7,400 remains to be voted in future years.—*The Times.*

Restoration of Cables.—It was decided in July last to re-open telegraphic communication with Germany, and the new cable ship *Monarch* started repair work in the North Sea on the Bacton-Borkum cables during the early part of August. Faults were cleared on Bacton No. 1 cable, and working commenced on August 23rd. The *Monarch* commenced the repair of Bacton No. 2 cable early in September, and on the Mundesley-Norderney cable in the middle of the same month. The repair of these three cables has provided 11 workable wires to Germany. One conductor in Bacton No. 2 cable, however, is faulty and unworkable; and two of those in Bacton No. 1 are also faulty, though workable with simplex Hughes apparatus. There thus remain for repair, when other work permits, the following Anglo-German cables:—Bacton-Borkum No. 3, Lowestoft-Norderney, and Lowestoft-Borkum, each of which has four conductors. During the war the repeater station at North Walsham had been dismantled of all repeating apparatus for use in other spheres; it was decided at the end of July to re-equip the station on the pre-war basis, and the station was ready for work in time for the re-opening of telegraphic communication with Germany. It was found necessary to replace several of the secondary cells, and some of the wiring had also to be renewed, but, on the whole, the condition of the equipment that had been left *in situ* was good.—*T. and T. Age.*

Sweden.—The Swedish Telegraph Administration has placed before the Government a scheme for the establishment of a large wireless station for communication with the United States. It is considered that the existing station at Karlsborg cannot be extended so as to deal with American messages, and it is, therefore, suggested that a new station should be erected near Falkenberg,

with masts 200 metres high, of a capacity of from 300 to 400 KW., and a wave length of 17,000 metres. The expenditure is estimated at 10,000,000 kr. and the annual working expenses at 850,000 kr., and it would be possible to complete the work early in 1923.

It is reported from Stockholm that the State telegraph authorities have tested a Swedish invention which is claimed to enable wireless messages to be kept secret. The device is said to consist in the use of "a kind of electrical vibrator."

Telephone Delays.—Mr. Illingworth, replying to questions in the House of Commons, last week, stated that the number of applications received for telephones from January 1st, 1919, to January 1st, 1920, was approximately 94,300; the number of new installations completed, excluding those for Government Departments, was 61,987. The total number of telephone intruments provided in these new installations and in extensions of existing installations was 103,686. The delay in providing telephone circuits in certain districts was generally due to shortage of spare wires in the underground cables or want of accommodation for additional circuits on the exchange switchboards, and to difficulty in obtaining from contractors an adequate supply of manufactured material, including underground pipes, switchboards, and other plant. There were a large number of contractors for various classes of telephone equipment; any firm might compete on furnishing satisfactory evidence of ability to meet Post Office requirements. As a general rule tenders would not be invited from manufacturers outside the United Kingdom. Of 27,547 instruments recovered from Government Departments, it was not possible to say how many were included in the 103,686 telephones installed for private subscribers. The instrument was only a relatively small part of the apparatus required to give telephonic service.

Telephone Exchanges.—Two new telephone exchanges—Broadway and Latchmere—have recently been put into operation, and others will shortly be added. These two are extensions of the Stratford and Battersea exchanges, and were installed to relieve the pressure in those districts. Four new telephone exchanges will be set up at the Tower, Holborn (the old Inns of Court Hotel), Marylebone, and Clerkenwell. Alterations and extensions are also contemplated at Erith, Esher, Harrow, Redhill, Sidcup, and Woodford. In addition, a new exchange, to be known as the Toll Exchange, is to be opened in the City, and will deal solely with short-distance trunk calls, up to about 50 miles.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared.)*

OPEN.

Australia.—MELBOURNE.—April 12th. City Council. Two 2,000-KW. rotary converters; H.T. switchgear, 6,600 v.; D.C. switchgear, 600 v. (January 30th.)

Bacup.—March 27th. Electricity Department. Annual contracts, including cables, fuses, lamps, meters, &c. (March 19th.)

Bedford.—March 31st. Electricity Department. Twelve months' supply of electricity meters and H.T. and L.T. cables. (March 5th.)

Bedwellty.—April 12th. Urban District Council. Electric wiring, fittings, &c., at Pengam and Aberbargoed. (See this issue.)

Belgium.—April 7th. The municipal authorities of Ixelles, Brussels. Supply of a quantity of armoured cable for low-tension distribution mains. Specifications may be obtained from the Maison Communale, Ixelles, for two francs.

April 6th. Municipal authorities of Chassepierre (Province of Luxenbourg). Tenders for a central electric lighting station in the town.

Bradford.—Board of Guardians. Installation of a telephonic system at St. Luke's Hospital, and extension of electric lighting system at Bowling Park Institution. Mr. F. Holland, engineer, 22, Manor Row.

Canterbury.—April 19th. Electricity Department. One 1,000-KW. three-phase turbo-alternator, surface condensing plant, two rotary converters, superheater, &c. (See this issue.)

Durham.—Board of Guardians. Installation of electric lighting at the Workhouse. The Clerk.

Eastbourne.—April 16th. Electricity Department. Supply and erection of one water cooling tower. (See this issue.)

Edinburgh.—March 29th. Electricity Supply Department. Condensing plant for Portobello station. Specification No. 23. (February 27th.)

Great Yarmouth.—April 16th. Electricity Department. One 2,000-KW. turbo-alternator, one 750-KW. rotary converter and transformer, and one 750-KW. frequency changer. (March 19th.)

Leith.—Town Council. Materials for the year, from May 16th, including overhead, electrical and car fittings, and insulated wire, &c. Mr. J. A. Greig, Town Clerk.

Lincoln.—April 8th. Electricity Department. Pipework, and motor-generator and switchgear for St. Swithin's power station. (March 5th.)

Limerick.—March 31st. Electricity Department. General stores, cable, meters, lamps and accessories. (See this issue.)

London.—SHOREDITCH.—Electricity Supply Department. Water-tube boiler, 5,000-KW. turbo-alternator, E.H.T. and D.C. switchgear. (March 19th.)

HAMMERSMITH.—March 31st. Electricity Department. E.H.T., H.T. and L.T. cables, 3¼-in. and 4-in. conduit, E.H.T. and H.T. switchgear, static transformers. (See this issue.)

Margate.—April 15th. Town Council. Electric light installation, pavilion and winter gardens. Mr. J. E. Saxby, Manager.

Newport (Mon.).—March 27th. Tramways Department. Tramway bodies, trucks, electrical equipment. Mr. A. Nichols Moore, Borough Electrical and Tramways Engineer, Town Hall.

Peterborough.—Electricity Department. 1,000-KW. turbo-alternator with condenser and pipe work, switchgear, 500-KW. rotary converter, superheaters, induced draught fan, two sets forced draught furnaces, foundations and builders' work, and H.T. cables. (March 19th.)

South Africa.—April 24th. Oudtshoorn Municipality. Time for receipt of tenders extended from March 24th to April 24th.

Spain.—Municipal authorities of Lora del Rio (Province of Seville). Tenders for the concession for the electric lighting of the town during a period of 20 years.

CLOSED.

Aldershot.—Urban District Council:—

Boilers for the electricity works.—Babcock & Wilcox, Ltd., £3,495.

Belgium.—The municipal authority of Couckelaere has placed a contract with the Anglo-Belgium Co., of Ghent, and the Société Electricité et Mecanique, of Brussels, for plant for an oil engine-driven central electricity generating station, the first named concern supplying the engines, and the Brussels Co. the electrical plant.

Glasgow.—Electricity Committee. Recommended:—

Bruce Peebles & Co., Ltd.—Four 6,500-volt, 1,500-KW. rotary converters, with transformers, £36,400.

Metropolitan-Vickers Electrical Co., Ltd.—Three 20,000-volt, 1,500-KW. rotary converters, with transformers, £29,310; and one 6,500-volt, 500-KW. rotary converter, with transformer, £3,790.

British Thomson-Houston Co., Ltd.—One 20,000-volt, 1,500-KW. rotary converter, with transformer, £8,750.

The Committee has accepted the offer of the Corporation of Alloa, for the purchase of second-hand plant, at the Partick Electricity Works, consisting of boilers, engines, converters, &c., at £20,000.

Town Council. Accepted:—

50 pressed-steel gear cases.—Wm. Little & Sons.
Forgings for car trucks.—English Electric Co., Ltd.
Trolley cable.—B. I. & Helsby Cables, Ltd.

Government Contracts.—The following Government contracts have been placed during February, 1920:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Armature drying plant.—Manlove & Alliott.
Centrifugal circulating pump.—Brush Electrical Engineering Co., Ltd.
Electric crane.—Cowans, Sheldon & Co., Ltd.
Conversion of steam crane.—Ransomes & Rapier, Ltd.
Electric lighting.—Foot & Milner.
Electrical boxes, &c.—Basebe, Sadler & Co., Ltd.; Hawkers, Ltd.
Blast fans.—Jas. Keith & Blackman Co.
Generator and switchboard.—The British Electric Plant Co.
Gas-filled lamps.—General Electric Co., Ltd.; Siemens Bros. Dynamo Works, Ltd.
Motor and control gear.—Electromotors, Ltd.
Motor generator set and switchgear.—Brush Electrical Engineering Co., Ltd.
Reconstruction of motor.—British Electric Plant Co., Ltd.
Underground cables and electric lighting.—Macintosh Cable Co., Ltd.
Motor-driven sewage pumps.—Pulsometer Engineering Co., Ltd.

MINISTRY OF MUNITIONS.

Electric storage battery.—Chloride Electrical Storage, Ltd.
Generators.—Eastgate Meller, Ltd.; Leading Light Syndicate, Ltd.
Insulators.—G.E. Co., Ltd.; Siemens Bros. & Co., Ltd.
Telephones.—G.E. Co., Ltd.

POST OFFICE.

Protective apparatus.—Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Telegraph apparatus.—Automatic Telephone Manufacturing Co., Ltd.; B.I. & Helsby Cables, Ltd.
Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British L.M. Ericsson Manufacturing Co., Ltd.; International Electric Co., Ltd.; Western Electric Co., Ltd.
Telegraph and telephone cable.—Callender's Cable & Construction Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.
Lamp caps.—C. A. Apperley.
Casing and cover.—Siemens Bros. & Co., Ltd.
Insulator cloths.—Thomas Brigg (London), Ltd.
Cords for telephones.—London Electric Wire Co. & Smiths, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Western Electric Co., Ltd.
Earthenware ducts.—Doulton & Co., Ltd.; Stanley Bros., Ltd
Insulators.—Taylor, Tunnicliffe & Co., Ltd.
Insulating tape.—Siemens Bros. & Co., Ltd.
Telephones.—Siemens Bros. & Co., Ltd.
Troughing.—Doulton & Co., Ltd.
Copper enamelled and silk covered wire.—Concordia Electric Wire Co., Ltd.
Switchboard wire.—London Electric Wire Co. & Smiths, Ltd.
Accumulators.—Tower, Bishopsgate, Marylebone and Holborn Relief Exchanges.—D. P. Battery Co., Ltd.

Laying conduits.—City of London, Westminster and Chelsea: J. Mowlem & Co., Ltd. Stepney, &c.: Foot & Milne, Ltd. Hammersmith: Laing & Co. Willesden, &c.: O. C. Summers. Hornsey, &c.: O. C. Summers. Fulham, Battersea, Wandsworth and Merton: Laing & Co. Maidenhead: J. A. Ewart, Ltd. Clerkenwell area: J. Mowlem & Co. Maryhill: Greig & Matthews. Heywood-Middleton: A. Armistead. Blackwall Lane: O. C. Summers. Cuckmere-Eastbourne: W. Dobson. Bexley Heath: J. Mowlem & Co., Ltd. Wimbledon-Earlsfield: J. Mowlem & Co., Ltd.
Motor-driven compressor plants.—Leafield and Cairo Wireless Stations: Reavell & Co., Ltd.
Telephone exchange equipment.—Hornsey: Western Electric Co., Ltd. Leith: Western Electric Co., Ltd. Hurley: Siemens Bros. & Co., Ltd. Glasgow (South): Western Electric Co., Ltd.

India Office (Stores Department).

Armatures.—Greenwood & Batley, Ltd.
Low-resistance cells.—Siemens Bros. & Co., Ltd.
Motor converters.—Bruce Peebles & Co., Ltd.
Electrolytic copper.—Elder Smith & Co.
Carbon cups, &c.—Peel Conner Telephone Works, Ltd.
Cell elements.—General Electric Co., Ltd.
Induction motor.—Siemens Bros. & Co., Ltd.
Motors and control panels.—Lancashire Dynamo & Motor Co., Ltd.
Pumping machinery.—Worthington-Simpson, Ltd.
Copper wire.—T. Bolton & Sons; Callender's Cable & Construction Co., Ltd.; Elliotts Metal Co.; R. Johnson & Nephew; Shropshire Iron Co.; F. Smith & Co.

Crown Agents for the Colonies.

Telephone cables.—Siemens Bros. & Co., Ltd.
Lux cells (parts for).—Chloride Electrical Storage Co., Ltd.
Insulators.—Taylor, Tunnicliffe & Co., Ltd.
Insulator spindles, &c.—Bayliss, Jones & Bayliss, Ltd.
Telegraph instruments.—Elliott Bros. (London), Ltd.; Automatic Telephone Manufacturing Co., Ltd.
Telegraph line material.—Siemens Bros. & Co., Ltd.
Telephones, &c.—British L.M. Ericsson Manufacturing Co., Ltd.; Gent & Co., Ltd.; Western Electric Co., Ltd.
Wireless apparatus.—Marconi Wireless Telegraph Co., Ltd.

H.M. Office of Works.

Engineering services.—Electric passenger lift, Manchester Pensions Offices: Marryatt & Scott, Ltd.

Lanarkshire.—With reference to the notice appearing under this heading in our last issue, Messrs. Ferranti, Ltd., inform us that they have not offered to supply an imported meter.

London.—L.C.C. The Highways Committee recommends that it be authorised, during the Easter recess, 1920, to open any tenders involving capital expenditure over £1,000, which may be received for the supply of materials, &c., and for the execution of work included in the order of reference to the Committee.

Battersea.—Electricity Undertaking Committee. Recommended:—

Fan for the upper rotary room at the generating station, £90.—Sturtevant Engineering Co., Ltd.
5,000-kw. turbo-alternator and Mirrlees condenser, £35,335.—Fraser and Chalmers Engineering Co., Ltd.

Hackney.—Electricity Committee. Recommended:—

Extension and completion of the sub-station at Northwold Road:—

L. H. & R. Roberts	**£4,421** (recom.)
Stapleton & Sons	4,490
Marrable Bros.	4,600
W. Shurmur & Sons	5,488
Barrett & Power	6,682

Supply of E.H.T. cables in connection with the extension scheme adopted January 28th last.—B. I. & Helsby Cables, Ltd.

Hull.—Electricity Committee:—

Richardsons, Westgarth & Co., Ltd. £17,734.—New condensing plant.
Stirling Boiler Co., £15,470.—Two new boilers.

FORTHCOMING EVENTS.

Royal Institution of Great Britain.—Saturday, March 27th. At Albemarle Street, Piccadilly, W. At 3 p.m. Lecture on "Positive Rays," by Sir J. J. Thomson, F.R.S.

Institution of Electrical Engineers.—Monday, March 29th. Informal meeting. At the Albert Tavern, 83, Victoria Street, S.W. At 7.30 p.m. Social evening (smoker).

Illuminating Engineering Society.—Tuesday, March 30th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 8 p.m. Discussion on "Motor-car Headlights in Relation to Traffic Requirements," to be opened by Mr. J. W. T. Walsh.

Association of Engineering and Shipbuilding Draughtsmen.—Tuesday March 30th. At Liverpool University. At 7.30 p.m. Lecture on "Elementary Calculus," by Mr. S. Clowes.

Technical Inspection Association.—Tuesday, March 30th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 5 p.m. Annual general meeting.

Rontgen Society.—Tuesday, March 30th. In the X-Ray and Electrical Departments of St. Bartholomew's Hospital, E.C. At 8.15 p.m. General meeting.

NOTES.

The Batti-Wallahs' Society.—The following is a list of new officers elected at the annual meeting on March 15th:—

President.—W. Wyld. *Vice-President.*—W. E. Ireland. *Past Presidents.*—H. T. Harrison, L. M. Waterhouse, W. Riggs, M. S. Chambers, F. J. Collis, J. S. Huddleston, J. F. Avila.

Committee.—E. Barralet, A. W. Blake, L. S. Richardson, J. P. Maginnis, R. Smith, H. Foulds.

Hon. Sec. Treasurer.—F. Pooley.

Hon. Entertainment Secretary.—A. J. Greenly.

Appointments Vacant.—Cable jointer (88s. 4d.), for the Tynemouth Corporation Electricity Department; E.H.T. plumber jointer (87s. 11d.); meter superintendent, for the Borough of Tunbridge Wells Electricity Works; electrical engineer, for the installation and inspection of consumers' meters (Rs. 540 per month); electrical engineer, for the position of deputy engineering agent (Rs. 1,250 month), for the Calcutta Electric Supply Corporation, Ltd.; charge engineer (88s.), for the Dewsbury Corporation Electricity and Tramways Department; boiler house superintendent (£400), for the Bristol Corporation Electricity Department; telegraph inspectors (£200 + £65) for the Tanganyika Territory Posts and Telegraph Department. See our advertisement pages to-day.

Glass Manufacture for the Electrical Industry.—The figures which were recently given in the Electrical Review, in reference to the output of electric bulbs by a Westlake machine at Leamington-on-Tyne, have since been exceeded. It was regarded by the trade as a remarkable performance that the machine should produce 24,000 perfect articles in an eight-hour shift, especially as the normal weekly productivity of 180 men was somewhere about half a million. Last week, however, the machine in question turned out 570,000, which constitutes a world's record. The moulds scarcely missed during the whole week, which is a reflection of the good work of the metal gatherers. The firm marked their appreciation of this by voluntarily increasing wages by 5 per cent. Makers generally are moving rapidly in the glass trade. This week it is announced that a new combine, involving £1,000,000, is to be floated, with the primary object of increasing the output of table glass, but in the production from the new machines which are about to be introduced, electric lighting goods, and illuminating ware generally, will eventually find a prominent place. Manufacturers are in the happy position of being able to export bulbs. In this direction they have recovered quicker than any other section of the trade. The arrangements which have been made between Philips, of Holland, and the Edison Swan Co., at Ponder's End—referred to in the annual report of the former company, abstracted in last week's Electrical Review—are more important than at first sight would appear to be the case. Philips's is the finest glass house in the world, and, to ascertain the methods of work there, the Ponder's End firm sent a deputation of workmen over to Holland. They found that six men were working at a pot, instead of three, as is the case in this country, and this, of course, meant that fewer moulds of the machines went round empty. It is now stated that the workmen in this country have undertaken to work the same system.

Siemens Copper Works in Russia.—It is reported that the managers of Siemens Copper Works, at Kadabek, near Elisabetpol, South Russia, have been compelled almost entirely to stop working, as the copper deposits are exhausted. On the other hand, the second mine—the Quarz Chana, near Batoum—still contains ore, and the production could be raised to 10,000 poods of pure copper monthly. Operations at present, however, are in considerable, chiefly owing to the difficulty that funds are not available for the payment of wages. It is thought that if the Siemens Works at Tiflis had energetic representatives who could induce the Georgia Government to make advances on the copper produced, so as to defray the working expenses, it would be possible again to bring about an increase in the output.

Educational.—University College, London.—At a luncheon last Friday in connection with the Engineering Equipment and Endowment Fund, at which Prince Arthur of Connaught, the President of the Fund, was chairman, he warmly commended the scheme to the audience, pointing out that 3,000 members of the University served in the war, that all the departments had been occupied in war work, and that the new chemical laboratories had done work of extreme national importance. So far £24,000 had been subscribed out of the £100,000 required. The Vice-Chancellor explained the scheme, and Sir Robert Hadfield regarded it as a national matter. Sir Gregory Foster said the college was crammed to overflowing; since September last, 400 applicants had been refused admission for lack of accommodation, and next session their difficulties would be seriously increased.

A further appeal has been issued on behalf of the Ramsay Memorial Fund, in order that an adequate sum may be provided to erect a Ramsay Memorial Laboratory of Chemical Engineering. A sum of £25,000 has been allotted to that purpose from the fund, but an additional sum of £50,000 is required to complete and endow the Laboratory.

Imperial College of Science and Technology.—An appeal is being made by this College for funds required to carry on its work efficiently. In May last year there were 841 students in attendance, and the accommodation will this year be taxed to the utmost. A committee has been appointed to conduct the appeal, of which Mr. Otto Beit is the chairman; donations may be sent to the Marquess of Crewe, Crewe House, Curzon Street, W. 1, or to the Secretary of the College.

Electric Club Dinner.—The Birmingham and District Electric Club held its annual dinner at the Grand Hotel, Birmingham, on Saturday, March 20th. The president, Mr. H. W. Wolton, was in the chair. The evening was greatly enjoyed by over 100 members and friends, the toast list and musical programme being both well selected and well received. The club is looking for a considerable increase in membership as a result.

Inquiries.—Makers of the "Zodiac" electric lamp are asked for. Information regarding electric incubators is desired; names of manufacturers and catalogue; also makers of plant for manufacturing calcium carbide.

Electric Vehicle Progress.—The Accrington Gas and Water Board is applying for permission to borrow £2,500 for the purchase of an electric storage battery locomotive. The Rotherham Corporation is applying for permission to borrow £2,740 for the purchase of two electric vehicles to be used by the Highways Department. The South Shields Cleansing Committee is to purchase two electric vehicles. An electric vehicle for refuse collection purposes has been ordered by the Stockton Corporation. The Torquay Town Council is purchasing two 2-ton electric vehicles at a cost of £1,372 each, from Edison Accumulators, Ltd. Mr. J. Jackson, superintendent, Birmingham Salvage Department, states that they "have four electrics working, 25 on order, and hope shortly to place an order for another four, making our total fleet for this year 33, which will, I think, be the largest number in use by any Corporation in this country. They are doing excellent work, and we are well satisfied with the vehicles."—*Electric Vehicle.*

Sir E. Geddes on Transport.—Sir Eric Geddes, Minister of Transport, discussed at length the future of British railways in his presidential address on Monday at the inaugural meeting of the newly-formed Institute of Transport, held at the Institution of Civil Engineers. There was a large attendance, and Sir John Griffiths, President I.C.E., presided. The following were, according to *The Times*, the chief points in Sir Eric's address:—

None of the transport agencies of this country could carry on on the basis of their pre-war revenue. This applied to railways in a marked degree; it also allied to roads, canals, tramways, and docks, yet the healthy existence of these agencies was vital to the State. The maximum charges which could be imposed by statutory undertakings were no longer sufficient, and the community must review the whole position. The old bargain must be altered to enable the companies to raise more money; but to avoid waste there must be more co-operation between the agencies, more amalgamation, more national control. He was not discussing the question of ownership. The State must have power to reduce working costs in every possible way, and it must be supplied with figures showing that the management was efficient and economical. The man in the street must be provided with full, accurate, and "live" statistics of operation, without which suspicion would never be dispelled. The community had a right to say what was a reasonable service for a statutory company to perform; what reasonable improvements should be made; and what reasonable rates should be charged. The State must also harmonise the operation of the different agencies in the interests of the community, allocating to each the share of the total work which it could best perform. They were on the eve of great extensions of the application of electricity to railway traction; a revolution was taking place in the organisation of transport in this country. The Institute could hardly perform a service of greater practical utility than to act as an impartial umpire, in the battle between alternating and direct current, remembering always that the scientifically ideal best, was not necessarily the same as the best practically possible.

British Engineering Standards Association.—In conformity with the Articles of Association, providing for rotation of office on the Main Committee, whereby one-third of the nominees retire each year, the Councils of the Technical Institutions which founded the Association have now made their new nominations, which take effect on March 31st. The Main Committee will then be constituted as follows:—

Sir Archibald Denny, Bart. (Chairman).

Sir Maurice Fitzmaurice, C.M.G. (Vice-Chairman).

* Sir John Aspinall, † Sir Arthur Duckham, K.C.B., Sir William Ellis, G.B.E., Sir William Matthews, K.C.M.G., Mr. Alexander Ross, Dr. W. C. Unwin,	Nominated by the Institution of Civil Engineers.
‡ Sir Henry Fowler, K.B.E., Sir Vincent Raven, K.B.E., Dr. William H. Maw.	Nominated by the Institution of Mechanical Engineers.
Dr. Arthur Cooper, § Mr. M. Mannaberg, ‖ Mr. Benjamin Talbot.	Nominated by the Iron and Steel Institute.
Sir W. E. Smith, C.B., Sir Thomas Bell, K.B.E.,	Nominated by the Institution of Naval Architects.
Col. R. E. Crompton, C.B., Sir John Snell,	Nominated by the Institution of Electrical Engineers.
¶ Mr. C. H. Wordingham, C.B.E.,	Co-opted by the nominated members to represent the Federation of British Industries.
Mr. F. W. Gilbertson, Mr. F. R. Davenport,	
The Hon. Sir Charles Parsons, K.C.B., Sir Richard Glazebrook, K.C.B., Sir Robert Hadfield, Bart.,	Co-opted by the nominated members.

* Sir Douglas Fox, retiring.
† Sir Robert Elliott-Cooper, K.C.B., retiring.
‡ Mr. H. A. Ivatt, retiring.
§ Mr. George Ainsworth, deceased.
‖ Mr. Illtyd Williams, retiring.
¶ Mr. C. P. Sparks retiring.

Freemasonry.—The members of the Kelvin Lodge are reminded of the regular meeting which is due to be held to-night (Friday, 26th inst.) at Mark Mason's Hall, Great Queen Street. Early attendance is requested.

Railway Electrification.—As we recently announced, the Ministry of Transport has appointed a Committee to report to the Minister on the question of railway electrification. The Committee, which met for the first time on Monday last, is constituted as follows:—Sir Alexander Kennedy (chairman), Sir John Aspinall, Mr. A. R. Cooper (representing the London Electric Railways), Mr. Philip Dawson, Sir Alexander Gibb, Mr. C. H. Merz, Sir Philip Nash, Sir John Snell, Mr. Roger T. Smith, Sir Henry Thornton (representing the Railway Companies' Association); Major Redman, secretary.

The terms of reference to the Committee are that the Committee should report on:—

1. Whether any regulation should be made for the purpose of ensuring that the future electrification of railways in this country is carried out to the best advantage in regard to interchange of electric locomotives and rolling stock, uniformity of equipment, and or other matters.

2. If any such regulations are desirable, what matters should be dealt with, and what regulations should be made.

3. How far it is desirable, if at all, that railways or sections of railways already electrified should be altered so that they may form parts of a unified system.

INSTITUTION NOTES.

Royal Institution.—The following are included in the list of forthcoming arrangements:—

Friday, April 16th, at 9 p.m.—"Ions and Nuclei," by Dr. J. A. McClelland, F.R.S.
Friday, May 21st, at 9 p.m.—"The Thermionic Valve in Wireless Telegraphy and Telephony," by Dr. J. A. Fleming, F.R.S.
Friday, May 28th, at 9 p.m.—"Crystal Structure," by Prof. W. L. Bragg.
Tuesdays, April 13th and 20th, at 3 o'clock.—"Recent Advances in X-ray Work," by Major G. W. C. Kaye, D.Sc.
Tuesdays, May 25th and June 1st, at 3 o'clock.—"The Evolution of Large Bridge Construction," by Major C. E. Inglis.
Thursdays, April 15th and 22nd, at 3 o'clock.—"New Experimental Studies in the Liquid State," by Mr. Sidney Skinner.
Saturdays, April 17th and 24th, at 3 o'clock.—"The Thermionic Vacuum Tube as Detector, Amplifier and Generator of Electrical Oscillations," by Dr. W. H. Eccles.
Saturdays, May 29th and June 5th, at 3 o'clock.—"Recent Revolutions in Physical Science," by Mr. J. H. Jeans, LL.D. (Secretary Royal Society).

Bradford Textile Society.—On March 15th, Mr. Edwin Preece, consulting engineer, lectured on "Electric Driving of Textile Mills," and in the course of his observations gave a full description of the Tata Hydro-Electric Power Co.'s scheme in Bombay. Mr. A. M. Chapman presided.

Bristol Association of Engineers.—The concluding meeting of the 1919-20 session of the Association was held, under the presidency of Mr. J. McDonald, on March 17th. After dinner a paper was read by Prof. David Robertson, D.Sc., M.I.E.E., on the "Principles of Radio-Telegraphy," and a discussion followed. The election of officers and members of Committee for the next session was as follows:—President, Mr. Nicholas Watts; vice-president, Prof. David Robertson; hon. sec., Mr. H. T. Sully; and hon. treasurer, Mr. B. de Sayres, together with Messrs. A. E. Livermore, R. Robertson, and A. Davis.

Chief Technical Assistants' Association.—The annual general meeting of the above Association was held at Anderton's Hotel, Fleet Street, E.C., on the 16th inst. The retiring chairman, Mr. J. H. Parker, A.M.I.E.E. (President E.P.E.A.), reviewing the work of the Association during the past year, referred to the Electricity (Supply) Act in which, due to the activities of this and other Associations, a fairly satisfactory Compensation Clause had been inserted. He found that the papers read and discussed were very beneficial indeed in the discharge of their duties, as they were all directly connected with the work of electricity supply. Mr. A. P. MacAlister, A.M.I.E.E., was elected chairman, and in thanking the members for the honour, said he had hoped that Mr. Parker would continue in office for another year, so as to occupy the unique position of chairman of the C.T.A.A., and President of the E.P.E.A. at the same time, but, unfortunately, Mr. Parker could not find time for both. The following were the other officers elected for the ensuring year:—Vice-chairman, Mr. J. R. J. Bowden (Hackney); hon. treasurer, Mr. A. Murdoch (Fulham); hon. secretary, Mr. H. F. J. Thompson (Battersea); executive committee, Mr. J. H. Parker (Croydon); Mr. W. Young (Stepney); Mr. G. C. Law (Barnes).

Association of Mining Electrical Engineers.—The North of England Branch of the Association entertained a number of prominent members of the mining industry to luncheon on March 20th, at Newcastle-on-Tyne, following which a meeting was held. More than one speaker mentioned that since the Association was inaugurated the efficiency of electrical plant in mines had appreciably advanced. It was stated that during 1913, 11 accidents occurred in the North of England which could, in any way, be attributed to the use of electricity, while in 1919 the number of accidents fell to seven, although the installed horse-power had increased from 144,259 to 250,000 H.P. The figures represented one accident per 13,000 H.P. in 1913, against one per 36,000 H.P. in

1919. All the foregoing accidents, except one, were non-fatal. It was stated that the efficiency of colliery officials and engineering staffs had been improved by the exchange of ideas and visits to other works.

Institution of Electrical Engineers.—At a meeting of the Western Centre at Bristol, on March 1st, Prof. D. Robertson gave a lecture on "Electric Impulse Clocks." After explaining the principle of the pendulum and the methods of compensation for errors due to temperature, friction, &c., the lecturer described the electrical impulse systems of the Synchronome Co., Messrs. Gent & Co., and the Silent Electric Clock Co. The lecture was illustrated with lantern slides and a collection of clocks in motion. In the discussion which followed, Mr. F. Hope-Jones emphasized the importance of imparting an impulse to the pendulum only at the centre of its swing, and of controlling the dials in series in such a way that their self-induction ensured their receiving an adequate impulse. Mr. H. T. Sully described the clock installation at the Southmead Infirmary, Bristol.

Coventry Engineering Society.—Mr. E. A. Watson, M.Sc., A.M.I.E.E., gave an instructive lecture, on March 19th, on "Electric Sparks, Spark Gaps and Spark Plugs, and their Relation to the Magneto." He dealt with the nature and meaning of dielectric stress, and the influence thereon of gap length and electrode shape. Discussing the nature of the spark, he explained the formation of disruptive sparks without corona and sparks accompanied by corona, and illustrated this phase of his subject by some interesting experiments. He explained the behaviour of different spark gaps with different forms of spark generator, the effect of wave form, and submitted a number of charts showing the impulse ratio. Factors governing the incendivity of the spark, and the best sort of spark to produce ignition, were particularly noted by the audience, and, proceeding to deal with the reaction of the spark gap upon the magneto, the speaker described the effect of voltage characteristics and spark-gap resistance. Mr. A. P. Young presided, and a hearty vote of thanks was passed to the lecturer.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

We read in the *Times* that on March 17th Sir Richard Glazebrook, late Director of the National Physical Laboratory at Teddington, was presented by the staff with his portrait in oils,, painted by his cousin, Mr. Hugh de T. Glazebrook. Accompanying the gift was an album, containing an illuminated address, followed by the signatures of past and present members of the staff, and a photograph of the laboratory taken from an aeroplane. Mr. F. E. Smith, F.R.S., presided, and Dr. T. E. Stanton made the presentation.

Whitehaven T.C. has referred back to the Lighting Committee a recommendation to increase the salary of the electrical engineer, Mr. Hogarth, to £500 a year.

Swindon T.C. is recommended to increase the salary of the borough electrical engineer from £350 to £450 a year.

Mr. J. M. Keenan, deputy borough electrical engineer at Torquay, has been appointed engineer and manager of the Thanet Electrical Co., Ltd., of Margate.

Walsall T.C. has advanced the salary of the electrical engineer from £650 to £800 a year.

Mr. W. W. Lackie, C.B.E., M.Inst.C.E., M.I.E.E., chief engineer and manager of Glasgow Corporation electricity department, who is leaving Glasgow on his appointment as one of H.M. Electricity Commissioners, was presented on Friday night with a silver tray from the employés of the department. Mr. R. B. Mitchell presided over a large gathering.

Mr. W. H. Hellyar, formerly engineer and manager of Chipping Norton electricity works, has been appointed resident mechanical and electrical engineer on the King's Estate at Sandringham.

The *Times* states that Lieut.-Col. W. H. D. Clark, O.B.E., H.M. Patent Office, and late Controller of the Munitions Inventions Department, has been appointed Chief Examiner of H.M. Patent Office, London.

The London County Council Highways Committee recommends that a gratuity of £500 be granted Mr. J. Terry, acting traffic operation superintendent of the Council's tramways, who is retiring after nearly 40 years' tramway service.

Mr. N. W. Prangnell has joined the staff of Messrs. C. A. Parsons & Co., at Newcastle. After being demobilised from his war service with the Navy he did not return to his old post of distributing engineer to the Metropolitan Electric Supply Co. While waiting for a new opening he has been acting as Controller of the Engineers' Stores Section of the Disposal Board.

Messrs. Handcock, Dykes & Trotter, consulting engineers, of 11, Victoria Street, Westminster, S.W. 1, announce that, owing to the decision of Mr. A. P. Trotter to retire to the country, where he will devote himself to his special scientific subjects, the firm has from the 25th inst., resumed the old name of Handcock & Dykes, under which it was founded in 1894.

After numerous postponements of the matter, the Bray Urban District Council has increased the salary of Mr. W. J. U. Sowter, electrical engineer and manager, from £330 to £425 per annum as from March 31st, 1919, and that of Mr. V. Dempsey, assistant electrical engineer, to £250 per annum as from March 31st, 1918. These increases, together with similar increases to the other officials of the Council, have been granted as the result of an award made by an arbitrator appointed by the Ministry of Labour. A section of the Council was reluctant to accept the provisions of the award, but it was pointed out that failure to comply with the findings of the arbitrator might result in a strike of the officials concerned. In the end, after considerable acrimonious discussion, the Council decided to adopt the terms of the award.

Obituary.—Mr. A. G. Lyster.—The death occurred last week, at the age of 68 years, of Mr. Anthony G. Lyster, who several years ago retired from the position of engineer-in-chief to the Mersey Docks and Harbour Board, and entered the consulting engineering firm of Sir John Wolfe Barry.

Mr. E. Duckworth.—News from South Africa reports the death, at Cape Town, of Mr. Ernest Duckworth, due to collapse following an operation for appendicitis. Since 1903 Mr. Duckworth had been on the staff of Cape Town electricity works, holding a responsible position at their Dock Road power station.

Mr. E. Lee.—The death is announced of Mr. Edwin Lee, who had for some years carried on business as an electrical engineer at 111, Union Street, Torquay.

NEW COMPANIES REGISTERED.

Palmer, Riley & Co., Ltd. (165,386).—Private company. Registered March 17th. Capital, £10,000 in £1 shares. To take over the business of electrical manufacturers and factors carried on by W. Palmer and J. E. Riley at Market Chambers, Backburn Road, Accrington, as "Palmer, Riley & Co." The first directors are: W. Palmer, 201, Blackburn Road, Accrington; J. E. Riley, 12, Royle Road, Chorley. Secretary: J. E. Riley. Registered office: Market Chambers, Blackburn Road, Accrington.

Magnetic Transmission Co., Ltd. (165,420).—Registered March 18th. Capital, £300,000 in £1 shares (195,000 preferred ordinary). To take over the right to manufacture and sell in the U.K. the system of power transmission known as the "Entz Magnetic Transmission," together with the right to export to any place outside the U.K. motor cars and automobiles after the same have been completed and the Entz transmission installed therein, or any other article for which the said transmission may be useful, and to adopt an agreement with L. Crown and the Owen Magnetic Transmission Syndicate, Ltd. The subscribers (each with one preferred ordinary share) are: L. V. Rothschild, 25, Sackville Street, W.1), engineer; R. G. Wilson, 23a, Bruton Street, W.1, engineer; J. L. Crown, Gwydyr Mansions, Hove, engineer; and four others. Minimum cash subscription, £7. J. L. Crown is the first director. Solicitor: N. P. Arnold, 35, King Street, Covent Garden, W.C.

R. J. Richardson & Sons, Ltd. (165,142).—Private company.—Registered March 11th. Capital, £10,000 in £1 shares. To carry on the business of mechanical, electrical and general engineers, manufacturers of dynamos, lamps, cycles, motor and accessories, &c. The first directors are: R. J. Richardson, The Croft, Ravenhurst Road, Harborne, Birmingham; J. J. Richardson, 67, Carless Avenue, Harborne, Birmingham; R. R. Richardson, 66, Carless Avenue, Harborne, Birmingham. J. T. Richardson, The Croft, Ravenhurst Road, Harborne, Birmingham. Registered office: Commercial Street, Birmingham.

Taylor, Hunter & Co., Ltd. (165,152).—Private company. Registered March 11th. Capital, £5,000 in £1 shares. To carry on the business of electric and general engineers and contractors, builders, builders' merchants, &c. The subscribers (each with one share) are: W. Baines, Broad Street House, E.C.2, clerk; C. R. J. Enever, Broad Street House, E.C.2, articled clerk. The subscribers are to appoint the first directors. Solicitor: C. R. Enever, Broad Street House, E.C.

Phœnix-Tester, Ltd. (165,138).—Private company. Registered March 11th. Capital, £2,000 in £1 shares. To carry on the business of electrical and mechanical engineers, &c. The first directors are: F. H. Lemaire, 80, Cowley Road, Mortlake, S.W.; A. Mungovan, 35, Parolles Road, Highgate, N.; J. F. Tester, 44, Doneraile Street, Fulham, S.W.; T. E. Turner, Owls Park Avenue, Potters Bar. Registered office: 76, Gamage Building, Holborn, E.C.1.

Road Guides, Ltd. (165,231).—Registered March 13th. Capital, £250,000 in £1 shares. To take over patent 131,235 of 1919, for the U.K. and Isle of Man, in respect of improvements in route indicators for use on road vehicles, &c. The first directors are: A. E. Newton, 50, Pall Mall, S.W., managing director of British Motor Trading Corporation, Ltd.; J. I. Ker, J.P., General Buildings, Aldwych. Qualification, £100. Solicitors: Dodd and Blaker, 50, Pall Mall, S.W.

Simms Motor Units (1920), Ltd. (165,482).—Registered March 19th. Capital, £120,000 in £1 shares. To take over the business of Simms Motor Units, Ltd., except debts and cash, and to carry on the business of manufacturers of and dealers in magnetos, magneto parts and accessories, motors, flying machines and cycles, &c. The subscribers (each with one share) are: J. B. Purchase, 14, Regent Street, S.W.1, solicitor; A. T. Hales, 14, Regent Street, S.W.1, secretary; and five clerks. Minimum cash subscription, £7. The subscribers are to appoint the first directors. Solicitors: J. B. and F. Purchase, 14, Regent Street, S.W.1.

Scottish Aluminium Co., Ltd. (11,043).—Private company. Registered in Edinburgh, March 17th. Capital, £25,000 in £1 shares. To carry on the business of manufacturers and producers of and dealers in aluminium and aluminium products, &c. The subscribers (each with one share) are: A. W. Stewart, 55, West Regent Street, Glasgow, engineer; W. M. Stewart, 55, West Regent Street, Glasgow, engineer; F. C. Stewart, 55, West Regent Street, Glasgow, engineer. The first directors are: A. W. Stewart, W. M. Stewart and F. C. Stewart. Secretary: F. C. Stewart. Registered office: 150, Helen Street, Govan, Glasgow.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Launceston and District Electric Supply Co., Ltd.—Particulars of £3,500 debentures created July 24th, 1920, filed pursuant to Section 93 (3) of the Companies (Consolidated) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Bradbury & Jarvis, Ltd.—Land registry charge on 9, Charlotte Place and 5, Bennett Street, N.W., dated March 4th, 1920, to secure all moneys due or to become due from company to London Joint City and Midland Bank, Ltd.

Burnham and District Electric Supply Co., Ltd.—Debenture dated March 2nd, 1920, to secure £3,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: T. G. Tolliott, High Street, Burnham-on-Sea, and W. Moon, Blue Boar Row, Salisbury.

Sun Electrical Co., Ltd.—Satisfaction to the extent of £275 on March 1st, 1920, of debenture stock dated March 31st, 1911, securing £7,000.

Howard Electrical Engineering Co., Ltd.—Issue on March 4th, 1920, of £1,000 debentures, part of a series already registered.

Oliver Engineering Co., Ltd.—Particulars of £1,000 debentures created February 6th, 1920, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £500. Property charged: The company's undertaking and property, present and future. No trustees.

Penrose Lifts, Ltd.—Particulars of £5,000 debentures created March 1st, 1920, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future. No trustees.

Camden Metal Works, Ltd.—Debentures to secure all moneys due or to become due from company to British Electric Transformer Co., Ltd., Hayes, registered February 13th, 1920, charged on the company's undertaking and property, present and future, including uncalled capital.

Cape Electric Tramways, Ltd.—Capital £500,000 in £1 shares, of which to December 31st, 1919, 491,222 have been issued, £91,222 paid, £400,000 considered as paid. Mortgages and charges, £276,300.

Francis Barker & Son, Ltd.—Mortgage on 219, Blackstock Road, Islington, registered February 13th, 1920, to secure all moneys due or to become due from company to London County Westminster and Parr's Bank.

Yale Electric Power Co., Ltd.—Debentures for £6,000 registered February 9th, 1920, charged on the company's undertaking and property, present and future, including uncalled capital. Satisfaction registered February 12th, 1920, of charge for £3,000, registered February 2nd, 1914.

CITY NOTES.

The British L. M. Ericsson Manufacturing Co., Ltd.

At the annual meeting, held on March 17th, Mr. W. M. Crowe, who presided, said that though profit for the year was smaller than in the previous two years, comparing the results with those of some of their competitors in the telephone industry, it was satisfactory. The past year had been a difficult one for telephone manufacturers. The Post Office officials left it late in the year before they decided to place orders on a large scale. Those officials were not to blame for that as they had the Treasury to deal with, and the Treasury were not now allowing any money out of their hands if they could help it. Then after large orders were placed (and they had placed large orders) there came the difficulty of getting raw material, the imports of which had been far below the requirements; and after that the difficulty of getting the workpeople to turn out sufficient output. The prospects of the present year were extremely bright for the company if they could only count on getting raw material and sufficient output. They had already in hand very large orders for telephone material of all kinds, and they were informed by the British Post Office that there were plenty of further orders only waiting to be placed. In addition to the supply of telephones for the home markets there was an immense demand from the Colonies and from foreign countries. He referred last year to the country's necessity for increased output so as to save a very serious situation; things had become worse instead of better. His calculation was that the American worker turned out about 40 per cent. more per worker per annum than men doing the same work in this country; and in Sweden and other neutral countries practically the same percentage held good. We were not likely to overcome and overtake the immense expenditure of the past six years unless the workpeople of the country saw through the evil of their ways. The whole world was crying for material of every kind and description, and the supply of that material could be made the means of setting the country on its feet again. British-made material was demanded probably more than the manufactures of any other country in the world, America included. It would be to the immense advantage of both sides if labour in this country would do its share and deliver the goods as they were being delivered in other countries. If, on the other hand, the trade unions were to force workers to limit the output—and that even against the wishes of a large proportion of the workers who, to his knowledge, would rather work hard and earn, say, £4 or £6 a week, than slack and take only the allowance granted them under trade union rules—then the country must thank the trade unions for leading towards disaster. There was no other way to save the country than by increased output. What the unions were doing was putting a premium on inefficiency and laziness, and making their first-class men into second and third class, so that presently there would be no first-class workers, but everyone would be on an equality. The fear of the unions that there was a likelihood of a shortage of work must appear to anyone who knew the facts of the case a useless fear. There were more orders waiting than could be handled during the next five years, and plenty afterwards for a further five years. The orders already in the hands of every manufacturer in the country, and the thousands of orders waiting to be placed were infinitely greater than the world had ever known, and the country which could turn out most would, of course, get the largest share of these orders. If the claims of the Labour Party for State control of the mines, the railways, shipping, &c., should become accomplished facts, the beginning of the end was near. After the speaker had briefly summarised the financial results, the report was adopted. The chairman said the question of raising additional capital had been before the directors, and when the time was opportune an issue would be made, and the claims of the preference shareholders would be considered.

Chelsea Electricity Supply Co., Ltd.

At the annual meeting, on March 17th, the chairman said that the accounts proved that the industry had quite extraordinary powers of recuperation. All the companies operating in the great centres of population had shown remarkably improved results, although notwithstanding a rise in prices generally of 100 to 200 per cent. on pre-war figures the price of electricity had only been raised from 25 to 33 per cent. Although he prophesied a year ago that they might look for improved results at no distant date, he must confess he did not think the change for the better was so near at hand. The total costs had risen by £2,700, nearly the whole being due to increases in salaries and wages. The receipts from sale of current increased by nearly £10,000. They had spent large sums on renewals and renovations, and must also spend largely during the current year on work which could not be carried out during the war, and was therefore much in arrear. The outlook for the present year was promising. They were selling more current and getting a somewhat better price. Repairs and maintenance costs which jumped £2,000 last year should show a reduction. Unless the unexpected should happen they ought to be able to recommend another increase in dividend next year. If the Government would leave them alone and allow them to carry on their business under the terms of their provisional order which expired in 1931, they could look forward with reasonable hope for a modest prosperity during the next eleven years. Their provisional order provided that if taken over in 1931 they were to be paid the "then value" of their capital expenditure. If Parliament decided to expropriate them earlier, common honesty would have proposed at least values as defined by the provisional order plus compensation for loss of profits of the unexpired term. But the Bill as introduced during last session provided for the compulsory acquisition of electrical undertakings at cost price, less depreciation, a figure very far below the present value of their undertaking as laid down in the provisional order, so that a solemn undertaking by Parliament under guarantee of which their capital was subscribed, was proposed to be broken by the Bill of last year. Fortunately the compulsory clauses of the Bill were withdrawn. The Government threatened to reintroduce the compulsory clauses during the present session, but if the proposals for amalgamation of leading London companies were approved, he hoped that they would not suffer as at one time appeared probable.

Notting Hill Electric Lighting Co., Ltd.

Mr. A. E. Franklin, presiding at the annual meeting on March 9th, said that new consumers were coming on so rapidly that it had been impossible to obtain delivery of meters as fast as they wanted them, but that condition was improving. The increase in profit was from £20,017 to £31,225; it would not have been so satisfactory but for the serious setback during the war. They had now made good their loss of ground, and continued their former rate of progress. The revenue from the sale of current increased by about £12,000, due largely to the higher rate charged coming into effect. They had lent to the Kensington and Notting Hill joint works £8,350, and as orders had been given for a considerable quantity of new machinery to cope with the increasing output, it would be necessary for the joint committee to obtain further capital to meet that expenditure. The estimated amount to be spent this year was about £50,000, and the committee was considering how to obtain this on the cheapest terms, but he feared that the cost of borrowing was now a very serious figure. The articles restricted their borrowing powers, so they were proposing an alteration which would give them a free hand, and enable them, in case of necessity, to borrow in order to lend further amounts to the joint station, and also for the necessary extensions to the system of distribution. At the present time the generating station at Victoria Gardens was being kept as a standby, as the whole of the current required was being taken from the joint works, as this was more eco-

nomical. After referring to the Electricity (Supply) Bill, the speaker said that with regard to the prospects for the coming year, the output was still increasing rapidly, and everything pointed to a prosperous year's working, unless unforeseen trouble arose.

Bruce Peebles and Co., Ltd.

Mr. F. E. Andrews, presiding at the annual meeting, at Edinburgh, on March 19th, said that early in 1919 all their Government war contracts were cleared up, and they were to a considerable extent engaged in turning over from war work to their normal engineering business. This involved the dismantling of the shell shop, so they took advantage of the opportunity to effect other considerable rearrangements, which had resulted in increased efficiency and marked improvement in output, in spite of the moulders' strike, which greatly hampered their operations. Their relations with their own workpeople were of a satisfactory nature. They paid them well. He was hopeful that the unrest, which was perhaps a not unnatural sequence of the war, would gradually die away, so that they might steadily deal with the large number of orders on the books. The past year had not been without its anxieties, but notwithstanding the difficulties experienced, it was gratifying to know that with their enlarged works and the larger number of men employed, the output for 1919 was more than 50 per cent. greater in value than the previous year, and this increase was reflected in the improved financial results. The issued share capital remained as before. The mortgage debenture debt was being steadily and satisfactorily reduced year by year by the operation of the sinking fund. Debts owing by the company were £91,657, whilst debts owing to it amounted to £136,009; both these items showed an appreciable increase, due to the increased business. With regard to the suspense account, which consisted of reserves made from time to time for various contingencies and especially to meet any liabilities for excess profits duty, all outstanding questions up to the end of 1918 had now been finally adjusted, and they were therefore enabled, by transferring the balance available from the suspense account, to start a general reserve account, to which they also proposed to allocate £20,000 from the profits of the year. Owing to the amount of work on hand and in prospect, they gave out contracts last autumn for a considerable extension to the new heavy engineering shop. The building was already erected, and very shortly would be finished, provided with the requisite machine tools, and in full working order. Stock, stores, and work in progress were higher than a year ago, whilst debts owing to the company were over 50 per cent. higher, but all were quite good. The profit from manufacturing and trading, after making provision for excess profits duty, amounted to £51,810, as compared with £20,390 a year ago. It was proposed to pay the fixed dividend of 7½ per cent. on the cumulative preference shares, together with the further dividend of 2½ per cent., to which they were this year again entitled, all less income tax, of course, and as the balance sheet was now cleared up, and all outstanding questions with regard to excess profits duty, &c., had been settled, they recommended a dividend of 7½ per cent., less tax, on the ordinary shares.

British Engine, Boiler and Electrical Insurance Co., Ltd.

At the annual meeting, held at Manchester, on March 19th, the chairman (Mr. R. C. Longridge) stated that the company had again achieved a record increase in the volume of business transacted, the premium and fees for the year 1919 amounting to £208,970, as compared with £174,162 in 1918, but there was a falling off in the profit earned. The following table shows that although the income from premiums and fees has almost doubled during the past five years, the amount of profit earned was £3,978 less than in 1914, or a reduction of over 22 per cent. In other words, the ratio of profit to premium income has fallen from 15.5 per cent. to 6.5 per cent.

Year.	Premiums and fees.	Claims, expenses and provision for unexpired liability.	Trading profit.	Ratio to income from premiums and fees.
1914	£112,465	£94,993	£17,572	15·5%
1919	208,970	195,416	13,554	6·5

The net dividend paid in 1914 was £13,176, and in 1919 it was £12,495. The explanation is that the costs of working have risen more rapidly than the premiums. The following are particulars of the cost of effecting identical repairs in 1914 and 1919 respectively:—

	Year 1914.	Year 1919.
STEAM ENGINES.		
Valve spindle	£5	£16
Two-cylinder covers and pistons (same size in each case)	100	307
One 21" cylinder (Corliss engine)	190	350
Crosshead for horizontal engine	36	86
GAS ENGINES.		
Cylinder jacket for 7" cylinder engine	9	30
Crankshaft of 14" cylinder engine	34	123
Flywheel of 18½" cylinder engine	125	320
Exhaust valve box for 18½" cylinder engine	12	31
MOTORS.		
Rewind of armature for 2-H.P. motor	5	11
" " " " 5-H.P. "	6	14
" " " " 25-H.P. "	15	32

Apart from the cost of repairs, the salaries of the staff had been put on a higher basis to meet the new conditions. The company employed a large number of fully-qualified and experienced surveyors, some of whom were engaged on mechanical and some on electrical work. Their duties brought them into contact with other engineers whose wages had in many instances been raised more rapidly than those of the company's surveyors, and it had been a source of regret to the board that circumstances had not enabled them to deal more generously than they had done in the matter of staff salaries. The whole burden of the increased costs had been borne by the company, and to distribute the load equally higher rates were necessary, the increases charged hitherto having proved totally inadequate. The board decided during the year to establish a subsidiary company under the name of British Electrical Repairs, Ltd., for carrying out repairs to insured electrical plant. This should result in advantages to the company as well as to its clients, who would enjoy the benefit of having repairs carried out expeditiously and by the most modern methods.

Automatic Telephone Manufacturing Co., Ltd.

Mr. James Taylor presided at the annual meeting, held at Liverpool on March 16th. He said that the war and its after-effects had hit the company much more severely than had been the case with most other industrial concerns. During the war the company's efforts had been concentrated on war work that had now ceased, and an important factor which seriously affected the company's interests had been the failure of the British Post Office to place orders for automatic exchanges, which represented the chief item in the company's business. Leading Government officials had said that the Post Office had declined to place orders of the kind because of the high prices prevailing, but so long as they continued the policy of ordering in driblets instead of in bulk they could not expect cheap prices, and it was a matter of regret considering the successful manner in which the automatic exchanges erected by the company were working that the Post Office should adopt this attitude. Prior to the company purchasing automatic patents the Post Office had been consulted, and the promoters of the company were led to expect sympathetic support. To be put to the immense trouble and expense of preparing estimates for the Post Office only to be told that prices were too high had been a source of bitter disappointment to the directors. In view of the delay in the introduction of automatic exchanges on a large scale the company had given considerable attention to other branches of business, and had extended its work in railway signalling apparatus. In other branches new development work had taken place the costs of which were debited to the past year, while the profits could not come in until a later date. A large new machine shop had been erected, and they were now equipped to turn out much larger quantities of work in the most economic way. The company had suffered very severely from the increase in labour rates, mostly granted by way of award of the Court of Arbitration, and in some cases made retrospective. Thus goods had already been delivered before the award was given, and it had been impossible to collect the extra cost from the buyer. It was estimated that from this source alone the company's profits had suffered to the extent of £15,000. There had also been difficulty in recovering from the Government in respect of contracts made with various departments the extra cost due to increase in labour and material. The directors were still persevering in trying to get Government officials to meet the company in a reasonable manner. In regard to the arrangement made with the International Syndicate for the exchange of shares, a large majority of the shareholders had agreed to the new scheme, and they had therefore proceeded with the arrangements, and the new company had been formed. The contract having been ratified they could now go ahead and manufacture on a mass production scale, under which costs were bound to go down very considerably, and the British Post Office would no longer have the excuse to say that automatics which the world was adopting were too high in price.

British Aluminium Co., Ltd.

The report shows that the profits for 1919, after making provision for excess profits taxation, were £348,108, plus £31,380 brought forward. Income tax, depreciation of investments, and proportion of profits payable to directors, come to £94,500; prior lien debenture service fund £48,000; debenture stock service fund £43,224; reserve for depreciation £50,000; to reserve account £50,414. After paying the preference dividend and a total of 10 per cent., less tax, on the ordinary shares, £15,314 is to be carried forward. The reserve account has been increased to £520,414 by the transfer of £50,414 from the profits of the year. The articles are to be altered to allow for the capitalisation of the reserve fund. At a meeting on 30th inst., resolutions will be proposed for increasing the capital and capitalising £400,414, part of the reserve account, to be applied for the payment in full at par of £400,414 ordinary shares of £1 each, and the distribution of two of such fully-paid ordinary shares for each three ordinary shares now held, except as to resulting fractions, the shares represented by which will be sold and the proceeds distributed among the shareholders who would otherwise be entitled to the fractions. If all the resolutions referred to are confirmed and passed the balance remaining in the reserve account will be £120,000. The depreciation reserve account, including £50,000 charged against

the profits of the year, amounts to £500,000. Owing to the falling off in demand after the conclusion of the war, the output of the various works of the company was considerably curtailed during the first seven months of the year. Thereafter, the demand in this country and abroad increased rapidly and the various works were again put on full output. These conditions have since continued, and the present outlook is satisfactory. During the greater part of the year a substantial percentage of the sales was applied in reducing the stocks of metal in the hands of the Government, in accordance with agreements made by them with the producers. Since the beginning of the current year the balance of Government stock remaining to be sold has been purchased by the company, thereby relieving the general situation in the industry.

Metropolitan-Vickers Electrical Co., Ltd.—The profit for 1919, including £77,747 brought forward, amounts, after providing for excess profits duty, to £303,007. There is appropriated to special depreciation of plant, machinery, &c., £35,000; to general reserve £100,000; to dividend on the preference and ordinary shares at 8 per cent. per annum, less income tax, £116,917; and carried forward £51,089. The year has been one of considerable anxiety owing to labour troubles, not only in connection with transport, but with the iron foundries. Though these difficulties coming at the latter part of the year did not seriously affect the accounts of the period, they will without doubt have some adverse effect on the results of the current year. The dividend is calculated from the date of allotment on April 14th, 1919, to December 31st, 1919. During the year 10,086 preference shares have been converted into 20,172 ordinary shares, which will receive 8 per cent. for the year. During the remaining period of the option conversion dates will be quarterly. New office premises have been secured at 4, Central Buildings, Westminster, S.W., where all the London staffs of the various associated companies will be, as far as possible, accommodated in one building. It is hoped to remove there before the end of April. Meeting: Monday, March 29th; London.

Davis & Timmins, Ltd.—At the annual meeting, on March 16th, Sir Henry Mance, who presided, said that the prospects were extremely good. Their main object at present was to increase their capacity for work and prompt delivery, and with that view they were obtaining additional machinery and making extensions at the works. Mr. G. E. Davis, the managing director, also said that the company's policy must be one of expansion. They were enlarging the works; new buildings covering the larger portion of the available land would probably be handed over to them for occupation early in May, and additional plant would be installed. They must be in a position to meet the demands made upon them for their manufactures. Five years of war had depleted the stocks of the world. The shelves of the nation were bare, and an effort must be made to make good the deficiency and the wastage of war if they were to hold their own in the markets of the world. Their order book had never been so full as it was to-day. They had lately developed the Colonial side of their business.

Newmarket Electric Light Co., Ltd.—Mr. F. E. Gripper presided at the annual meeting on the 15th inst. He said that owing to new connections and existing consumers' new demands they had increased the output by 10 per cent. The increase of £960 in revenue was practically swallowed up by increased working costs. The company had increased its charges by only 33 per cent. (from 6d. to 8d.), whereas everything else had gone up by 100 or 150 per cent. or more. He expected that their application for power to increase the charge to 10d. would be granted. Increased cost of plant, &c., meant that double what they had put away in the past would be required for renewals. They must make up the renewal fund to a reasonable figure to meet future liabilities.

Scarborough Electric Supply Co., Ltd.—During 1919 there were connected the equivalent of 7,541 30 watt lamps, making the total 144,703. Units supplied 1,057,707, an increase of 215,561. After paying bank interest, and putting £1,500 to depreciation, the profit on the statutory undertaking is £3,389, and the revenue from other sources £1,439, making £4,828, plus £3,431 brought forward. Dividend t the maximum rate allowed under the Scarborough Electricity (Temporary Increase of Charges) Order of 1918, namely, 2½ per cent., leaving £6,008 to be carried forward.

Automatic Telephone Manufacturing Co., Ltd.—It was announced at the recent meeting that preference shareholders who had not already availed themselves of the option to convert their shares into shares of the new International Automatic Telephone Co., Ltd., would be given an opportunity of reconsidering their decision, as the option would remain open until March 31st.

Wood & Cairns, Ltd.—Presiding at the annual meeting on 16th inst., Mr. R. K. Hill stated that trading results were very satisfactory. A dividend of 10 per cent., less tax, on both the ordinary and preference shares was declared; £1,150 was placed to reserve, and £1,001 carried forward.

Tucuman Tramways, Light & Power Co.—The profit for the year ended June, 1919, was £421. Debit balance carried forward is reduced to £61,141.

Stock Exchange Notices.—Application has been made to the committee to appoint special settling days in:—

British Electric Transformer Co., Ltd.—48 ordinary shares of £1 each, fully paid, Nos. 135,380 to 135,393, and 135,465 to 135,498.

Mann, Egerton & Co., Ltd.—11,207 ordinary shares of £1 each, fully paid, Nos. 1 to 11,207.

The committee has specially allowed dealings in the following under temporary regulation 4 (3):—

Stewarts & Lloyds, Ltd.—850,000 deferred shares of £1 each, 5s. paid, Nos. 850,001 to 1,700,000; 82,500 deferred shares of £1 each, fully paid, Nos. 1,700,001 to 1,782,500.

The Committee has ordered the undermentioned to be officially quoted:—

British Electric Transformer Co., Ltd.—62,500 6 per cent. cumulative preference shares of £1 each, fully paid (Nos. 200,001 to 262,500).

Oxford Electric Co., Ltd.—1,000 5 per cent. cumulative preference shares of £5 each, fully paid (Nos. 10,001 to 11,000).

The Committee has specially allowed dealings in the shares of the following:—

Mann, Egerton & Co., Ltd.—68,357 preference shares of £1 each, fully paid (Nos. 1 to 68,357); and 11,207 ordinary shares of £1 each, fully paid (Nos. 1 to 11,207).

Brompton & Kensington Electricity Supply Co., Ltd.—Mr. H. R. Beeton, presiding at the annual meeting, on March 18th, said that they connected more customers than ever before during 1919, and the lamp connections were higher than any previous year but one. This was mainly due to the growing conversion of large houses, many of which stood empty, into flats and maisonettes, all of which were occupied. The record load factor was largely attributable to the sedulous cultivation of the accessory load. The cost per unit sold was the same as last year, in spite of an increase in cost of coal and labour. The proposed appropriation of profits which was justified by the present circumstances and future prospects, might be regarded as some compensation for the abatement of dividend sustained for two years owing to Government interference and obstruction. The outlook was good if the general course of events were at all propitious. The Accessories Co. continued to justify its existence, and constituted an asset which was beyond the reach of compulsory purchase. The speaker referred briefly to the Electricity (Supply) Act, and to conciliatory agencies at work for the adjustment of the interests of Capital and Labour, and paid a tribute to the staff.

Metropolitan Electric Tramways, Ltd.—The revenue for 1919, apart from dividends receivable, was £805,777. After deducting expenses and debenture and loan interest, but without making provision for future renewals, the surplus was £14,151. Including the amount brought forward, and the dividend on the company's holding in the North Metropolitan Electric Power Supply Co. (£15,750), the available balance is £30,427, out of which £10,195 is put to reserve. A balance dividend of 3 per cent. in respect of 1917, and one of ½ per cent. in respect of 1918, on the preference shares, are to be paid, requiring £17,500, and £2,732 is carried forward. The company is promoting in the present session of Parliament a Bill to authorise increased fares, &c. In the early part of the year the N. Met. Electric Power Supply Co. experienced a large reduction in output in consequence of the smaller demand by power-users previously engaged in the manufacture of munitions, but towards the end of be year this was regained by increased consumption of electricity for industrial purposes. That company has declared a dividend on the ordinary shares at the rate of 4½ per cent. per annum for 1919. In July, 1919, Mr. W. M. Ackworth and Mr. W. C. Burton were appointed directors of the company. Mr. Burton was also appointed managing director in place of Mr. Devonshire, who resigned this position but remained a director of the company. Mr. Burton has resigned his position on the board on his return to America.

South London Electric Supply Co., Ltd.—Mr. H. B. Renwick, in addressing the annual meeting on March 16th, said they had to record a more successful year than for some time past. He said that the expenditure of £9,209 chiefly on mains and meters was a sure indication of the vitality of the business. Now that the company was taking bulk supply, nine-tenths of its future expenditure would be under those heads. In regard to the current year, the units sold since the commencement of 1920 showed an increase of 17½ per cent., and the KW. applied for, 18 per cent., as compared with 1919. The speaker, in referring to the Electricity (Supply) Bill, said that he was confident that, should the Government introduce another Bill this session, it would not again attempt to thrust upon the electricity supply companies a compulsory purchase clause on terms so harsh or unfair as those in the original Bill. The company was quite prepared to take a bulk supply from a central source and to hand over its generating station to a central authority, but the terms must be fair and reasonable.

Salisbury Electric Light & Supply Co., Ltd.—Gross profit on working during 1919 was £5,733, against £5,623 for 1918. A final dividend at the rate of 8 per cent. for the second half-year is to be paid, making 6 per cent. for the year; £3,000 to depreciation and reserve; £3,327 carried forward.

Waste Heat & Gas Electrical Generating Stations, Ltd.—The profit for the year ended January 31st, 1920, after deducting administration expenses, is £39,626 (against £38,646), less £13,500 put to reserve. The amount brought forward was £17,337. Of the available £43,464, the dividend of 8 per cent absorbs £25,600, and £17,864 is carried forward. The reserve account is now £113,851. The redemption funds in respect to plant supplied on hire purchase terms amount to £15,651. There has been considerable delay in the delivery of the plant for the new power station at Horden, and it is not expected that it will be completed and ready for operation until the middle of this year. The new generating plant at Weardale has been run satisfactorily, but it is not yet in continuous operation. Capital expenditure during the year amounted to £45,039 14s. 6d., mainly in connection with the new power station at Horden; against this, however, plant on hire of the value of £25,985 has been purchased by the hirers. A further £1,470 has been expended on the experimental work; it has been charged to the account opened for that purpose. The units generated at all the power stations show a reduction of about 2 per cent.

London Electric Wire Co. & Smiths, Ltd.—The report for 1919 states (according to the *Financial Times*) that the contracts and orders now on hand far exceed any total previously recorded. The usual provision has been made for depreciation of plant and machinery, and £49,000 has been placed to reserve, making the general reserve £50,000 and the special reserve £20,000 respectively. During the year the issued capital has been increased by £350,000. The new capital will be employed in extending the company's manufacturing facilities. The directors recommend a final dividend on the ordinary shares, making 7½ per cent., less tax, for the year, leaving to carry forward £28,414.

Aster Engineering Co. (1913), Ltd.—Mr. R. H. Wheeler, who presided on March 17th at the annual meeting, said that the company was fully booked up for 18 months ahead, and in view of further business that was offering it had become necessary to increase the output. For that purpose it was proposed to increase the capital by £100,000 in £1 cumulative and participating preference shares. The dividend for 1919 was 10 per cent., the same as for 1918. The company's export trade in Aster engines was increasing rapidly. It was their policy to create a world-wide demand for their products and not to limit themselves to any one line of production.

Hadfields, Ltd.—The report for 1919 states that £200,000, the premium received on the 1919 issue of ordinary shares, has been carried to special reserve. In addition to the interim dividend paid on the ordinary shares, a further 1s. 6d. per share, free of income tax, is proposed, and £133,755 is to be carried forward. An agreement has been entered into with Messrs. Harper Bean, Ltd. (which has £6,000,000 capital), a combination of a number of motor and kindred companies, under which that concern will obtain its supplies of steel from Hadfields, Ltd.

Para Electric Railways & Lighting Co., Ltd.—Gross receipts for the year ended November 30th, £299,282, compared with £284,255; net revenue earned in Para, after allowing for loss in exchange, £129,383, compared with £113,008; to reserve for depreciation and renewals, £20,000. Final dividend of 5 per cent. on the ordinary shares, making 8 per cent., against 7 per cent., less tax, for the year; to general reserve, £22,000, against nil; forward, £21,932, against £35,425 brought in.—*Times*.

Midland Electric Corporation for Power Distribution.—A meeting is called for April 19th, at which resolutions will be submitted for dividing the £5 preference and ordinary shares into £1 shares, and for increasing the capital by 200,000 £1 ordinary shares. The directors are placing £5,000 to reserve, and after writing £12,594 off expenses of debenture and share issues, and putting £14,000 to depreciation, the dividend on the ordinary shares is 10 per cent. for the year, carrying forward £29,818.

Hong Kong Tramway Co., Ltd.—Gross profit for 1919 £47,930. Final dividend 1s. 3d. per share, making 2s. total. Carried forward £7,116. Debentures redeemed. Debenture redemption reserve (£11,224) transferred to credit of profit and loss.

Isle of Wight Electric Light & Power Co., Ltd.—After providing £5,500 for debenture interest and sinking fund, £600 is applied to writing down investments, £6,500 is put to renewals fund, and £483 is carried forward.

Spanish & General Wireless Trust.—A meeting is being held to-day to consider a proposal for reconstruction under the title of the Spanish & General Corporation, Ltd.

Rangoon Electric Tramway & Supply Co., Ltd.—Dividend on the ordinary shares for 1919, 7 per cent. (against 5 per cent. for 1918), free of tax. Carried forward, £4,361.

Robey & Co., Ltd.—Dividend on preference and ordinary shares 7½ per cent., less tax. Carried forward £49,746.

Para Telephone Co.—Dividend 10 per cent. for 1919, carrying forward £6,426.

Shawinigan Water & Power Co.—Quarterly dividend on the common stock, 1¾ per cent.

STOCKS AND SHARES.

Tuesday Evening.

The financial year of the Stock Exchange came to its end on the Thursday in this week, and the present subdued condition of markets is indeed different from the excited buoyancy prevailing no longer than six weeks back. Investment money is either chary of existing Stock Exchange securities or else is finding employment elsewhere—probably both factors operate, along with the Budget and foreign exchange considerations, to lay strong restraint upon activity. Markets are so quiet that it is a matter of ease to thread a way even through those which have been so popular, and the Rugby scrums have given way to a state of affairs which discovers the paucity of sitting accommodation in most parts of the House.

New issues are being rushed out as fast as possible in order that the shares may be placed before Easter. Such extensive outpourings of capital as the first three months of the year have seen must constitute a record, and the full figures will be awaited with no little interest. The underwriters have found just lately that their obligations can become far from nominal, and a few of the big issues of the past week have been left, to a considerable extent, in the hands of those who underwrote them.

Bank Rate apprehensions are somewhat allayed by disclosure of an exceptionally strong position by the Bank of England statements. These are sufficient to calm the fears of a 7 per cent. minimum this week, although there remains a degree of uneasiness in regard to money, which the fresh disturbance of the French franc served to underline. Although marked recovery has begun in the German rate of exchange, and although the American dollar is also a shade less expensive, the outlook bristles with such uncertainties as render trading an extremely difficult and speculative business. This reacts, of course, upon wide circles of industrial shares, and even those that are not directly affected, are influenced by Stock Exchange sympathy. The labour troubles at home have a direct bearing upon everything connected with coal, and the investor, baffled and perplexed by a dozen cross-currents, decides to leave stocks and shares alone for a time. In which decision it may probably prove that he shows sound sense.

British Aluminiums fell rather sharply on the issue of the report. From 45s., at which they stood a fortnight ago, the shares have gone back to 38s. The profits of £348,000 are £72,000 down as compared with those for 1918, but the 10 per cent. dividend is maintained, and the report states that the present outlook is satisfactory. At the meeting next Tuesday, resolutions will be submitted for enabling the directors to distribute two new shares for every three at present held, for nothing, the money to be obtained by capitalising £400,414 of the reserve account, and distributing this, in ordinary shares, amongst proprietors in the proportion named. After this, the reserve fund will stand at £120,000, while the depreciation reserve will be £500,000.

Babcock & Wilcox are 6s. 3d. lower, and Metropolitan-Vickers preference lost half-a-crown. Siemens again shed sixpence, a fair number of shares coming to market. Telegraph Constructions have fallen back 30s. to 26½, the comparative smallness of yield on the shares inducing proprietors to seek higher returns elsewhere. Callender's are ¼ down. General Electrics are the turn off. The new ordinary, with 7s. 6d. paid, show a good deal of animation round about 12s., but the new B preference, with 7s. 6d. paid, continue heavy at 1s. 6d. discount. The fully paid have changed hands at about 18s. 9d. English Electric ordinary are 25s., the preference 16s., and the 5½ per cent. sinking fund 1st mortgage debentures 85. Electro-Bleach and By-Products ordinary are 20s.

Amongst electricity supply shares, London Electric preference and Westminster ordinary are both ¼ down, while Metropolitan preference at 2 13/16 show 1/16 loss. City of London shed its half-crown rise of last week, receding to 14, and the market is once more in a tame and uninteresting condition.

The River Plate Electricity Co., Ltd., has called a meeting for Monday next to pass resolutions that will enable the directors to capitalise some of the profits standing to the credit of the reserve fund, and to allot ordinary shares in respect thereof. Apparently the idea is to distribute the stock for nothing, which would represent a handsome bonus, the present ordinary standing about 148 in the market. For the last two years, the company has paid 7 per cent. dividend on the ordinary stock, the price of which on the outbreak of war ruled at 240.

The cable market continues to be principally occupied with the dealings in the new issues. Eastern new shares have risen to 8s. premium, Westerns and Globes are 3¾ premium, Eastern Extensions 3¼ premium. While a good many people are selling their rights with a view to taking the money as

extra dividend, a large number of others are adopting the suggestion made here, and paying for their allotments, rounding off their proportions of new shares by the purchase of such oddments as may be necessary to ensure a holding in level amounts. The old issues are beginning to recover, Eastern ordinary, for instance, showing a rise of 4½ to 157½. The other three have been placed on the common level of 15⅞. A rally in Anglo-American Telegraph deferred restored the price to 19, but the feature in this market is the strength of Oriental Telephones, which on their persistent buying were lifted 16s. 3d. to 2¼, from which they drooped to 2⅛. Various rumours are in circulation to account for the demand, but these are so nebulous as to render their repetition of no service. Curiosity is piqued to know what the reason for the jump actually is, and this no doubt will become apparent in due course. United River Plate Telephones have gone back to 7⅛, and Marconis reacted sharply to 3 9/16, a drop of 7s. 6d. on the week, Canadians and other members of the Marconi group being disposed to sag in sympathy with the shares of the parent concern.

Brazilian Tractions have fallen back to 52, on further sales from Paris, and there is no recovery yet in the stocks of the British Columbia Electric Railway. Mexican Light preferred at 27½ are 3 points down. Bombay Electric ordinary shares, after being nominally 165, were put down to 150, changing hands at 145½ and rather higher. Still there is nothing to explain the extraordinary rise of the past three months. The shares are 10½ times higher than they stood at the end of July, 1914. The rubber market shows no resiliency, the price of the raw material being dull. Armament and allied shares participate in the depression shown by most of the industrial sections.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1918.	Dividend 1919.	Price March 22, 1920.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	8	12	82	—	£8 16 10
Charing Cross Ordinary	4	7	82	—	9 0 8
do. do. do 4½ Pref.	4½	4½	93	—	8 3 8
Chelsea	3	4	82	—	6 3 1
City of London	8	10	14	— ½	7 2 10
do. do. 6 per cent. Pref.	6	6	93	—	6 4 6
County of London	7	8	93	—	8 2 2
do. do. 6 per cent. Pref.	6	6	9	—	6 13 4
Kensington Ordinary	6	7	5½	—	6 13 4
London Electric	Nil	2½	1⅞	—	5 2 6
do. do. 6 per cent. Pref.	6	6	84	— ½	8 17 10
Metropolitan	5	6	83xd	—	8 0 0
do. 4½ per cent. Pref.	4½	4½	2⅛	— ⅛	8 0 0
St. James' and Pall Mall	10	12	64	—	8 16 10
South London	5	6	28	—	7 12 8
South Metropolitan Pref.	7	7	19/6	—	7 3 7
Westminster Ordinary	8	10	5⅞	— ½	8 13 10
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	87½	—	6 17 1
do. Def.	33/6	1½	19	+ ½	7 18 0
Chile Telephone	5	6	6¾	—	*4 13 2
Cuba Sub. Ord.	7	7	10⅜	—	*6 18 4
Eastern Extension	8	10	15⅞	— ⅛	*6 10 1
Eastern Tel. Ord.	8	10	157½	+4½	*6 7 0
Globe Tel. and T. Ord.	8	10	15⅞	+ ⅛	*6 10 1
do. do. Pref.	6	6	9¼	+ ⅛	6 6 4
Great Northern Tel.	22	—	24	—	9 3 4
Indo-European	13	—	48½	—	6 18 4
Marconi	25	—	3 9/16	— ⅛	7 0 0
Oriental Telephone Ord.	10	—	2⅛	+ 1/16	3 12 9
United R. Plate Tel.	8	—	7⅛	— ⅛	*5 8 3
West India and Panama	1/8	—	1 1/16	—	5 19 0
Western Telegraph	8	10	15⅞	— ⅛	*6 10 1
Home Rails.					
Central London Ord. Assented	4	4	47½	—	8 8 6
Metropolitan	1	1½	21½	+ ½	5 16 3
do. District	Nil	Nil	12⅛	—	Nil
Underground Electric Ordinary	Nil	Nil	2½	— ¼	Nil
do. do. "A"	Nil	Nil	6/6	—	Nil
do. do. Income	5	4	69	—2	5 16 0
Foreign Trams.					
Anglo-Arg. Trams. First Pref.	Nil	Nil	32	—	—
do. do. 2nd Pref.	—	—	5½	—	—
do. do. 5 Deb.	5	5	69½	—	7 15 0
Brazil Tractions	—	—	52	—1½	—
Bombay Electric Pref.	6	6	19	—	3 3 0
British Columbia Elec. Ry. Pfce.	5	5	60½	—1	8 5 4
do. do. Preferrred	2½	5	51½	—	9 14 2
do. do. Deferred	Nil	3	41½	—	7 4 7
do. do. Deb.	4½	4½	57xd	—	7 9 1
Mexico Trams 5 per cent. Bonds	Nil	Nil	38½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	29½	—	Nil
Mexican Light Common	Nil	Nil	17½	—	Nil
do. Pref.	Nil	Nil	27½	—3	Nil
do. 1st Bonds	Nil	Nil	51½	—	—
Manufacturing Companies.					
Babcock & Wilcox	15	—	3⅜	— 1/16	*4 10 9
British Aluminium Ord.	10	10	1 15/16	— 1/16	5 5 0
British Insulated Ord.	12½	15	2⅜	— ⅛	7 1 2
Callenders	25	—	8½	— ½	7 2 10
do. 6½ Pref.	6½	6½	4⅞	— ⅛	6 16 10
Castner Kellner	20	—	4	—	—
Crompton Ord.	10	—	21/6	—6d.	9 6 0
Edison-Swan, "A"	10	—	1½	—	8 0 0
do. do. 5 per cent. Deb.	5	5	79½	—	6 5 9
Electric Construction	10	—	23/6	—6d.	8 10 2
Gen. Elec. Pref.	6½	6½	18/6	—	7 0 6
do. Ord.	10	—	1½	—	*5 10 4
Henley	25	15	2⅜	—	6 6 4
do. 4½ Pref.	4½	4½	3½	—	6 4 2
India-Rubber	10	—	15	—	*6 5 0
Mot.-Vickers Pref.	—	8	2⅜	— ⅛	6 16 5
Siemens Ord.	10	10	29/-	—6d.	*6 18 0
Telegraph Con.	20	20	20½	—1½	*4 19 6

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Tuesday, March 23rd.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/5	...
a Ammoniac Sal	per ton	£100	£5 inc.
a Ammonia, Muriate (large crystal)	,,	£92	£17 inc.
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£42	...
a Copper Sulphate	,,	£52	...
a Potash, Chlorate	per lb.	11d.	...
a ,, Perchlorate	,,	1/8	...
a Shellac	per cwt.	£42	...
a Sulphate of Magnesia	per ton	£18	£3 inc.
a Sulphur, Sublimed Flowers	,,	£28	...
a ,, Lump	,,	£25	...
a Soda, Chlorate	per lb.	6d.	...
a ,, Crystals	per ton	£12	20/- inc.
a Sodium Bichromate, casks	per lb.	...	...
METALS, &c.			
g Babbitt's Metal Ingots	per ton	£118 to £345	...
c Brass (rolled metal 2" to 12" basis)	per lb.	1/6½	½d. dec.
c ,, Tubes (solid drawn)	,,	1/6½ to 1/6¾	...
c ,, Wire, basis	,,	1/4½	½d. dec.
c Copper Tubes (solid drawn)	,,	1/9½	...
g ,, Bars (best selected)	per ton	£168	...
g ,, Sheet	,,	£168	...
g ,, Rod	,,	£168	...
d ,, (Electrolytic) Bars	,,	£117	£7 dec.
d ,, ,, Sheets	,,	£156	...
d ,, ,, Wire Rods	,,	£142	£3 inc.
d ,, ,, H.C. Wire	per lb.	1/4½	¾d. dec.
f Ebonite Rod	,,	3/-	...
f ,, Sheet	,,	2/6	...
h German Silver Wire	,,	3/-	...
h Gutta-percha, fine	,,	18/-	...
h India-rubber, Para fine	,,	2/4½	2½d. dec.
i Iron Pig (Cleveland Warrants)	per ton	Nom.	...
l ,, Wire, galv. No. 8, P.O. qual.	,,	£51	...
g Lead, English Pig	,,	£46	£6 10s. dec.
g Mercury	per bot.	£26 10/- to £27	£2 inc.
a Mica (in original cases) small	per lb.	6d. to 4/6	...
a ,, ,, ,, medium	,,	5/- to 10/-	...
a ,, ,, ,, large	,,	12/6 to 25/- & up	...
g Phosphor Bronze, plain castings	,,	1/7 to 1/11	1d. dec.
g ,, ,, rolled bars and rods	,,	2/2 to 2/6	...
g ,, ,, rolled strip & sheet	,,	2/3 to 2/9	...
d Silicium Bronze Wire	per lb.	1/11½	...
r Steel, Magnet, in bars	,,	1/8	...
g Tin, Block (English)	per ton	£341 to £342	£28 dec.
n ,, Wire, Nos. 1 to 16	per lb.	5/5	3d. dec.
White Anti-friction Metals	per ton	£90 to £345	...

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

The International Electrotechnical Commission.—We have received from Mr. C. le Maistre, general secretary, a copy of Publication No. 33 of the I.E.C., which is the full report of the fourth plenary meeting of the International Electrotechnical Commission, held in London last October. It includes photographs of the Rt. Hon. A. J. Balfour, Monsieur Maurice Leblanc (the past president), and the delegates. The report contains, in addition to the decisions reached at the last meeting, the programme of future work, which has already been described in our issue of October 31st, 1919. Meetings of the following advisory committees of the I.E.C. will be held in Brussels, commencing March 27th: (1) Nomenclature; (2) Rating of Electrical Machinery; (3) Symbols; and (8) Standard Pressures.

The following delegates of the British National Committee have been nominated provisionally, though it is not yet known whether they will be able to accept the task: (1) Nomenclature and (3) Symbols.—Sir William Slingo, Major K. Edgcumbe, Messrs. A. R. Everest, A. B. Field, and A. J. Stubbs. (2) Rating.—Sir Richard Glazebrook, K.C.B., Messrs. A. R. Everest, C. Rodgers, and Roger T. Smith. (8) Standard Pressures.—Messrs. C. H. Wordingham, C.B.E., A. R. Everest, W. B. Woodhouse, and Roger T. Smith.

The Belgian Electrotechnical Committee is actively engaged in completing the details in so far as the actual meetings are concerned. Although a very busy time is before the delegates, the Belgians are desirous of arranging for one or two excursions for the benefit of the foreign delegates.

The decisions made at these meetings will ultimately be placed before all the National Committees, with a view to their adoption at the next plenary meeting, which is expected to be held towards the end of this year.

The president of the Commission, Dr. C. O. Mailloux (U.S.A.), together with a strong delegation from the U.S. National Committee, will certainly be present at these meetings, and it is hoped that some of them will visit this country before returning to the States.

POWER FROM BLAST FURNACE GAS.

By S. H. FOWLES, A.M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers.)

In view of the fact that we as a nation have to make a considerable saving in our fuel consumption, we must first of all look to our efficiency. In many cases this is very low and wasteful. It is for us to look for better methods of using our wasted heat units, and thus make the best use of what we have, before attempting to harness any new powers.

One instance of great wastage is in the form of blast furnace gas, which escapes from the furnaces during the making of pig iron. The amount of energy which is at present being wasted or used at about 10 per cent. efficiency from the blast furnaces of this country is in the neighbourhood of 1 million horse-power. This is a matter that should be seriously taken up in connection with the greater power scheme, and should serve a very good purpose in the cheapening of electrical energy. Where the gas is cleaned and used efficiently, for the same quantity of gas an additional 10 thousand horse-power can be produced, and about 5 to 6 thousand horse-power saved on coal, making a net saving of about 16 thousand horse-power from three blast furnaces.

The gas is a by-product, and has been treated in the past as of very little value, being, therefore, either wasted or used very inefficiently. The furnaces are self-contained, with a large number of boilers for steam-raising to supply the blast engines for the furnace blowing. This blast in turn passes from the engine-driven blowers through the hot stoves to the furnaces. The hot stoves and boilers usually consumed the whole of the gas made, in addition to a very large amount of coal for the boilers.

The gas was used in its crude state, with the exception of the small amount of dust taken out by the dust catchers. This caused great loss in laying off the boilers for cleaning, which was a very frequent occurrence, as the boilers consumed about 1 million cubic feet of gas per hour.

In addition to the dust, the moisture had to be dealt with, and this considerably lowered the temperature of the fire box, thus causing the excessive use of coal with very inefficiently burnt gas. Many of the boilers on this class of work are in the open air and have no shelter; the settings are very often so porous that it is far from economical to use even clean gas in them, but during the transition stage this has to be done. The use of gas for boiler-firing is proving a very bad policy, since in comparison with large gas engines only about 30 per cent. of the engine efficiency is maintained on the boilers of modern design with clean gas.

The old method of using crude gas and coal had an efficiency of about 10 per cent., when compared on a horse-power basis with present-day gas-driven plant. Approximate figures for one furnace on the new method show that each furnace produces 1 million cu. ft. of gas per hour, and only 0.55 of this is required for the furnace, leaving 0.45 million or 450,000 cu. ft. of gas available per furnace for other purposes, and this at 150 cu. ft. per kw.-hour is equal to about 3,000 units of electricity per furnace per hour. Now with 50 furnaces the aggregate would equal 150,000 units saved per hour and 1,030,510,000 per annum; this with the boiler saving represents an economy of about 400,000 tons of coal per annum. This shows that the electrical energy which can be saved annually by generating from blast-furnace gas is almost equal to the total number of units sold during 1911-1912 by all the 303 electricity works of the United Kingdom.

The difference in coal and gas consumed, and the work done under crude and clean gas conditions respectively, is enormous. A great deal depends on the selection of a cleaning plant for this purpose, and while it is not intended to compare the merits or demerits of other plant, yet a great deal can be said for the Halberg-Beth dry gas-cleaning plant. It has considerable advantages, the following being a few of them: The bulk of the potash is recovered in its original state. The dust contents average 0.002 gramme per cu. m. The plant can be worked for long periods up to 30 per cent. overload if required. The moisture can be removed or allowed to remain at will. The total water contents average about 15 grammes per cu. m. The above figures can hardly be surpassed to-day on any plant when the dust and moisture are taken into consideration jointly and the power consumption per volume of gas cleaned.

The author then describes part of the plant at a large iron works, some details of which were given in our issues of January 23rd and 30th, 1920, and says that other cleaning plant is not in a position to guarantee such results of low dust and moisture contents which are common to engines, boilers, and stoves, so that in case of a temporary shortage of crude gas the valves to stoves and boilers can be closed and the engines kept running continuously. Another great advantage of this plant is the fact that, with no complete water passages or seals for the gas to pass for cleaning, in the event of a stoppage occurring on all the fan motors in the cleaning plant the engines will continue on load as usual, and will draw the gas through the plant just as clean as when supplied by the fan. This has been done for a period of an hour at a stretch.

The general operation of the Halberg-Beth gas-cleaning plant is then described by the author (for a similar description see our issue of February 6th, 1920). The plant works continuously and has a very low upkeep and operation cost.

The engines for generation comprise seven sets of 12-cylinder tandem vertical 1,500 h.p., direct-coupled to 1,000-kw., three-phase alternators running at 200 r.p.m., and are run in parallel with a public electric supply at 5,500 volts. In order to get good firing, the sparking plug points are adjusted to about 15/1000ths of an inch, and are of the motor car large type supplied from a l.t. magneto and induction coil, and very little trouble is experienced from dirt or moisture owing to the gas being dry and clean when leaving the gas plant. The throttles for air and gas are arranged on a common spindle, and the air throttles require more cleaning than the gas throttles, which shows that the gas is cleaner than the atmosphere. The machines run very steadily and synchronising is quite as easy as on a steam-driven set.

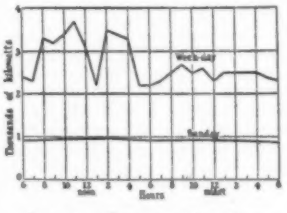

Fig. 1.—Typical Day Load.

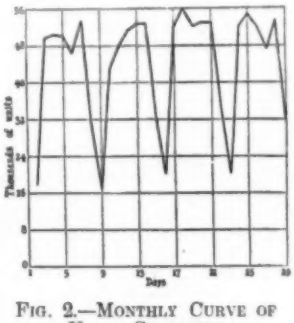

Fig. 2.—Monthly Curve of Units Generated.

The blowing engines of four sets are of the horizontal type with two double-acting gas cylinders and one double-acting blowing cylinder. They run at 85 r.p.m., are of 1,650 h.p., and can deliver 36,000 cu. ft. of free air per minute up to a pressure of 11 lb. per sq. in., or a decreased volume up to 15 lb. per sq. in. These engines supply the blast for the furnaces, and have been in operation for 1½ years very successfully. The ignition is by the l.t. drawn-out plug, operated with a solenoid in series, so that directly the arc breaks, the plunger is spring-returned ready for the revolving contact passing its brushes again on the lay shaft. The gas is quite free from tar, and pistons drawn after six months' running were found to be as clean as when first installed.

A great deal of attention has been given to the operation and maintenance of the cleaning plant. The gas is as clean as town gas and of low calorific value, but very constant, which makes gas engines as reliable as steam engines. After several inspections it was found to be possible to run for twelve months before overhauling. Curves of the various loads given in figs. 1 and 2 show the usual conditions in iron and steel works. A great deal depends on these conditions as to how the electrical world can make great use of the intervals should all the blast furnaces of this country become interconnected with the greater scheme of power supply. In the daily load curve (fig. 1) it will be seen that from 5 p.m. to 7.30 a.m. about 3,000 kw. of plant is idle. The whole of the gas is wasted during this period, and could be very usefully employed to supply power to a network through converting plant, thus allowing several medium-sized towns to take their supply from such a source and reduce considerably their coal, stores, and probably their wages costs during this period. A still greater loss is shown on the Sunday curve from Saturday noon to 7.30 a.m. on Monday, when 4,000 kw. of plant is idle, and could deal with the week-end load of several medium-sized towns, thus allowing the boilers in use and the staff to be considerably reduced and effecting a great saving of fuel and wages. It would also allow of a good many repairs being done, and so decrease the stand-by plant in many cases.

This matter should be considered seriously, as already we are making use of our water supplies which are not so constant as this supply. We have now some 50 places in this country where blast furnaces are working, and these are to be increased during the next few years. Many of these places cannot consume the whole of the gas produced, and with the adoption of cleaning plant such as have been mentioned, and the use of large gas engines, the time has arrived when still more gas will be available from the coke ovens

and from the coke used in the blast furnaces. The quantity of gas wasted, although small compared with the requirements of our power stations, is nevertheless a large item when taken collectively in the balance sheet. Coke-oven gas is richer in value than blast-furnace gas, and is not such an easy gas to use, but during the last three years a very ingenious valve has been adopted for mixing some of the exhaust-cooled gas from the engines with the coke-oven gas, thus avoiding the trouble of pre-ignition.

The whole of this subject should have a thorough investigation, with the ultimate view of connecting all blast-furnace supplies to the greater scheme of national power supply.

Balance sheets were given in an appendix to the paper showing the difference in the old and new methods of utilising waste heat; the saving that results from cleaning and using the gas efficiently; and a comparison of the 308 electricity works and the estimated waste gas of Great Britain's 50 blast furnace installations. Tables were also added giving the various constituents of the gas, the content value, the gas and oil used in various parts of the works, the number of units generated, and the pressures and temperatures maintained at various positions in the cleaning plant and engine rooms.

Discussion in London.

The above paper, as well as that by Mr. W. H. Patchell (an abstract of which appeared in our last issue), was read before the Institution on March 11th, the discussion, of which a *résumé* is given below, being concluded on March 18th.

Mr. P. Taylor, who confined his remarks to Mr. Patchell's paper, said it was a valuable one, and it contained much useful information on the subject which was usually scarce. He personally had seen the plant described, and he could confirm the statement that it had worked very well. The gas engine tests were taken under everyday running conditions, and it was possible to obtain even better results than were given in the paper. The author was justified in claiming 1.51 lb. of coal per kw.-hour produced, but that would not be the case if power alone were supplied, because credit for the exhaust steam and tar had to be taken into account. From a power point of view, the figure would be 1.7 lb., and the tar could be sold. The author's figure for repairs and renewal costs was too high. It would have served a useful purpose had a separate account sheet been added to show whether it really paid to recover the sulphate of ammonia, and the total amount of coal used should also have been stated. Each separate case should be considered on its own merits, and more detailed figures for comparison with others would be useful.

Dr. Morley thought that Mr. Fowles's paper contained much valuable first-hand information. The economies that could be realised by the efficient use of properly cleaned blast-furnace gas were enormous; there they had a practically untapped source of power. Even in works where the was was being used, there was still scope for economy; the practice of burning the gas under boilers was in some cases being abandoned in favour of gas engines. Two important reports had recently been presented to the Iron and Steel Institute, one by Prof. Bone and Sir Robert Hadfield, which contained much useful information on the subject, and the other by two gentlemen who had visited the Rhine Valley and seen the conditions there. The latter report was a striking and impartial testimony to the efficiency of the gas engine. There was not much to choose between the high and low speed types of gas engine as regarded reliability, neither type gave much trouble. Blast furnace gas was a very remarkable gas, it contained no tar whatever, which was the chief source of trouble to all gas engineers. The question of which type of engine to use required consideration; the advantage in favour of the high-speed vertical engine was that of capital cost, its reliability being equal to that of the horizontal low-speed type, but the life of the engine was an important consideration. It was only necessary to compare the life of a high-speed vertical aero engine with that of a low-speed horizontal gas engine to realise this point. Operating costs were very valuable, but it was also necessary to add maintenance costs. It was noteworthy that in Germany, the home and nursery of the large gas engine, the sole type in use was the horizontal engine. With regard to cooling the cylinders, in the Galway engine the water only passed through one moving part; the valve itself was not cooled, but only its seat and box. It was quite possible to build cylinders up to 55 in. in diameter. Considering the atmosphere in a gas engine station, there was no reason why it should not be as clean and sweet as that in a steam station. The question of the utilisation of waste blast-furnace gas was one of national importance.

Mr. W. B. Woodhouse gave it as his opinion that with the present high price of coal no case could be made for the by-product gas producer plant for the provision of power alone. The high initial consumption of gas rendered the gas engine uneconomical on anything under half load. This fact would necessitate the load factor being high and not 15 or 20 per cent., as was the case with some steam engines. It would certainly not pay to run a gas plant of this description on a load factor of, say, 10 per cent. He was sadly disappointed in Mr. Fowles's paper; it was not clear whether the paper attempted to describe certain plant or whether it was intended as a condemnation of the iron masters. Further, the author had not indicated which of his figures and statements were estimates or predictions, and which were facts. Actually, in the speaker's opinion, the position was not so bad as the author would lead one to suppose; the author did not appear to be aware of what had been done by the iron masters in recent years. It was not possible to utilise all the blast-furnace gas produced, because that would involve problems of storage, and there was also the question of the load factor of the electrical energy to be considered. He disagreed with the author's statement that the use of the gas for boiler firing was bad practice. He had built a small station in which this method was utilised, and very careful tests were taken of its operation. From the results obtained the station was comparable with a turbine station having an efficiency ratio of 75 per cent., and it was his opinion that a large station using gas-fired boilers would show good results. It was not clear what the author was driving at.

Capt. A. P. Pyne, referring first to Mr. Patchell's paper, said that it was unfair to compare the small installation described with large turbo-generator plant, because much better results could be shown if it were necessary to do so. Unfortunately there were not many 2-cycle gas engines that could be considered reliable; there was one type, regrettably of German make, however, that no one would hesitate to rely upon, even in sizes up to 1,500 h.p. The gas plant itself was perfectly to be depended upon. After referring to the financial aspect, the speaker said that those who imagined that the atmosphere in the gas-engine room was any worse than that in a steam station were quite mistaken, in many cases it was much better. Turning to Mr. Fowles's paper, the speaker said that his main contentions were quite correct, although his figures might be slightly optimistic. In spite of Mr. Woodhouse's remarks, there was, in the speaker's opinion, a large amount of blast-furnace gas wasted in this country, and there was much scope for improvement and economy in that direction. It had remained for the Germans to show what really could be done; in Germany he had seen numerous small plant scattered over the countryside driving gas-engine generators, and linked to the h.t. town supply system. Many other cases could be mentioned of plant successfully working on the Continent, and even in Russia. In 1914 there was not a single gas engine installation in this country that could compare with those at work in Germany. Gas engines were equal in reliability to steam plant, although the first cost of the latter was usually lower. He knew of a case where a gas engine had run for 24 hours per day for 365 days without being shut down or cleaned. It should be remembered that the reliability of the engine depended on the cleanliness of the gas, the dust content of which should not be higher than 0.002 gramme per cu. m. The Halberg-Beth dry gas-cleaning plant successfully met these requirements, but it was expensive in first cost, and it was here that electrical engineers had an opportunity of showing what electrostatic methods could do. Another point that should be remembered was that cleaning gas for use in a gas engine and under a boiler were two quite different problems. The point of his remarks was that everything he had said was merely a repetition of what he had told a similar meeting of the Institution some six years ago, and it was regrettable to find that during the interval practically nothing had been done to improve the condition of affairs in this country.

Mr. H. T. Gibbons, referring to Mr. Woodhouse's remarks, said that he had always understood the object of by-product gas producer plant to be the saving of coal, and Mr. Patchell's figures showed that a supply of electricity could be produced by this means at a cost comparable with that of a public supply. The author's figures for repairs and renewals cost were, however, rather high; this might be accounted for in the difficulty of obtaining certain materials during the war period. The makers had such confidence in Premier gas engines that they were prepared to guarantee them under all normal conditions. It was possible to build such engines having cylinder diameters up to 18 in. in diameter; four such units made up a complete engine, and to-day similar sets were giving satisfactory results. For the generation of electricity multi-cylinder engines were preferable, and it was probable that future large engines for this purpose would be a compromise between the vertical high-speed and the horizontal low-speed types. The latter type possibly took up more floor space, and necessitated heavier foundations, but against that could be set its longer life. He instanced a case where a gas engine had run for five months without being shut down and running periods of three months at a stretch were common. It was a significant fact that when once an iron master installed a gas engine in his works he invariably extended the plant, and Mr. Fowles was right in advocating closer co-operation between the iron masters and electricity supply undertakings.

Mr. J. Paton explained that conditions to-day were not so favourable to by-product producer gas plant as they were before the war. It would seem that the Lymn tower washers were not so efficient as the ordinary packed towers. Mr. Patchell's figure for capital cost per kw. of plant installed was too high, he knew of a case where the cost was more like £10.6 per kw. In attempting to treat by-product tar

satisfactorily it should be remembered that the tar contained a large amount of water; the tar should, therefore, be kept continually agitated until all the water had boiled off. This could be satisfactorily done by injecting compressed air into the bottom of the still.

Dr. J. A. Harker drew attention to the report of the Nitrogen Products Committee, which was appointed by the Ministry of Munitions. It contained, he said, much valuable and interesting information on the subject under discussion, and it was notworthy that Mr. Patchell's conclusions and observations were in strict accord with those expressed in the report referred to.

Mr. Bass expressed regret that neither the managing director nor the chief engineer of Messrs. Hoffmann was able to be present to express their opinions on the plant described by Mr. Patchell. All he could say was that any doubts that might have existed prior to the installation of the plant had been entirely dispelled after two years and eight months' very successful operation. It had been shown that gas plant lacked nothing in point of reliability, and with regard to exhaust boilers there had only been one stoppage in two years and eight months. It was not thought advisable to shut down the plant at the time the defect was noticed, it eventually, therefore, took longer to rectify than would otherwise have been the case. Anyone who cared to visit the works in question would see for himself that the popular conception of the dirty conditions usually associated with producer gas plant was an entirely mistaken one.

Mr. A. H. Lymn, with reference to Mr. Paton's remarks, explained that the efficiency of the Lymn tower washers was in no way behind that of other types if the plant was kept working on full load; with the Hoffmann plant these conditions were not fulfilled. If no gas flowed up the towers, the water falling on the first disk would drop to the bottom of the tower without touching any of the inverted cones. It would, therefore, be appreciated that it was due to the up-flowing gas that the water fell from the disks on to the inverted cones. Efficient washing resulted from the gas actually having to pass through the water as it was falling. It was noteworthy that corrosion did not take place in the Lymn plant to any appreciable extent except at such places as bolt joints, &c., which fact was attributable entirely to the construction of the plant. In horizontal tanks using paddles, and in which the level of the liquid was continually changing, corrosion was much more likely to take place. Mr. Patchell would have been quite justified in adopting manually-stoked producers if it had been possible to procure the quality of coal that it was initially intended to use.

Mr. H. Chaney endorsed Mr. Patchell's figures referring to the production of electricity. Personally, he used the steam first in turbo-generators, from the exhaust of which it passed on to the gas producers. The war had taught a good deal in the direction of utilising bad quality coal, and he himself had used coke dust to dilute the coal. He was of the opinion that the fullest possible use should be made of blast-furnace gases, and that towns in the neighbourhood of such furnaces should be compelled to utilise this source of power.

Mr. F. H. Preece did not understand Mr. Fowles's attitude with regard to using blast-furnace gas under boilers; his statements were misleading, and he (the speaker) could not agree with them. The whole of the trouble experienced with gas-fired boilers was due to dirty gas; they could not use Bunsen burners because they choked up. The firm with which he was connected used an external combustion chamber having air holes that could be adjusted from ¼ in. to 6 in. in diameter according to variations in the pressure of the gas. The difficulties encountered with heavy and frequently occurring variations in the gas pressure could readily be appreciated. With clean gas, however, they were able to use Bunsen burners, and by this means efficiencies of 70 to 76 per cent. could be obtained, or even 78 per cent. for the combined boiler, economiser, and superheater. Mr. Patchell's results obtained from waste-heat boilers were wonderful considering the low-temperature gases used.

Mr. L. Andrews said it gave him much pleasure to hear such papers read before the Institution. Some eleven years ago he had himself outlined to the Institution a similar plant to that described by Mr. Patchell, and it was interesting to compare the results then predicted with those actually obtained by the author. A very considerable saving in coal could be made by the use of gas engines; true, he agreed that for very large plant nothing at present could compare with the turbine, but there was, nevertheless, a large field open to the use of gas plant.

Mr. H. M. Ridge explained that he had only recently returned from a visit to Germany, where he had seen blast-furnace plant in operation, and it was interesting to note that to-day the works could not obtain sufficient coke to keep their furnaces working at anything like full load. He instanced one undertaking in Lorraine, but there were many others like it, which prior to the war had six blast furnaces at work. From these sufficient gas was obtained not only to drive the entire works, including rolling mills and all the electrical power used in them, but there was sufficient surplus gas to furnish the surrounding district with electric power and light. This emphasised the fact that under efficient working conditions an iron works could produce much more gas than it was possible to utilise in the works themselves. The difficulties met with in this country were due to dirty gas, and it was regrettable to see furnaces still working in this country to-day with open tops, from which all the gas was wasted. It was important to clean the gas; stoves would run for periods of two years without being cleaned if using clean gas, but with dirty gas the rich salts soon attacked the brickwork which it was necessary to renew every three to four months. He mentioned a case where the efficiency of clean boilers dropped appreciably after two hours' working on dirty gas, and after six hours they had to be shut down. The difference in the results obtained in the use of clean and dirty gas was equally striking, no matter in what manner the gas was used.

Owing to the lateness of the hour the authors reserved their replies to the discussion for publication in the Institution *Journal*.

THE IMPORTS OF SPAIN.

Statistics have recently been published concerning the import trade of Spain during 1917. Below are given the values of electrical and allied goods imported during that year compared with 1916, a note of increases or decreases being added:—

Country	1916 Pesetas	1917 Pesetas	Inc. or dec. Pesetas
Arc lamps.—			
France	4,000	1,000	– 3,000
United Kingdom	2,000	13,000	+ 11,000
Other countries	10,000*	—	– 10,000
Total	16,000	14,000	– 2,000
* Holland 9,000 Ps.			
Carbons for arc lamps.—			
France	1,000	2,000	+ 1,000
United States	2,000	3,000	+ 1,000
United Kingdom	4,000	—	– 4,000
Total	7,000	5,000	– 2,000
Incandescent electric lamps, mounted.—			
United States	245,000	227,000	– 18,000
France	60,000	84,000	+ 24,000
United Kingdom	60,000	178,000	+ 118,000
Holland	1,333,000	933,000	– 400,000
Switzerland	309,000	269,000	– 40,000
Other countries	214,000	1,000	– 213,000
Total	2,221,000	1,692,000	– 529,000
Dynamos, electric motors, induction coils, resistances, transformers, &c., up to 100 kg. weight.—			
Germany	6,000	3,000	– 3,000
United States	582,000	1,061,000	+ 479,000
France	271,000	223,000	– 48,000
United Kingdom	398,000	182,000	– 216,000
Holland	167,000	21,000	– 146,000
Italy	380,000	185,000	– 195,000
Portugal	—	2,000	+ 2,000
Sweden	147,000	26,000	– 121,000
Switzerland	392,000	295,000	– 97,000
Other countries	8,000	2,000	– 6,000
Total	2,351,000	2,000,000	– 351,000
Ditto, 101-400 *kg.*—			
United States	342,000	510,000	+ 168,000
France	222,000	68,000	– 154,000
United Kingdom	310,000	158,000	– 152,000
Italy	137,000	43,000	– 94,000
Portugal	—	4,000	+ 4,000
Sweden	258,000	35,000	– 223,000
Switzerland	248,000	336,000	+ 88,000
Holland	—	2,000	+ 2,000
Other countries	214,000	1,000	– 213,000
Total	1,731,000	1,157,000	– 574,000
Ditto, 401-2,500 *kg.*—			
United States	621,000	550,000	– 71,000
France	132,000	100,000	– 32,000
United Kingdom	895,000	350,000	– 545,000
Italy	86,000	41,000	– 45,000
Sweden	137,000	163,000	+ 26,000
Switzerland	460,000	458,000	– 2,000
Other countries	9,000	—	– 9,000
Total	2,340,000	1,662,000	– 678,000
Ditto, 2,500-5,000 *kg.*—			
United States	96,000	360,000	+ 264,000
France	17,000	478,000	+ 461,000
United Kingdom	62,000	67,000	+ 5,000
Sweden	87,000	8,000	– 79,000
Switzerland	129,000	98,000	– 31,000
Total	391,000	1,011,000	+ 620,000

	1916 Pesetas	1917 Pesetas	Inc. or dec. Pesetas
Ditto, over 5,000 kg.—			
United States	1,462,000	404,000	−1,058,000
France	175,000	245,000	+ 70,000
United Kingdom ...	202,000	68,000	− 134,000
Switzerland	444,000	833,000	+ 389,000
Sweden	86,000	—	− 86,000
Other countries	—	1,000	+ 1,000
Total	2,369,000	1,551,000	− 818,000
Accumulators and electric batteries.—			
Denmark	42,000	8,000	− 34,000
United States	41,000	321,000	+ 280,000
France	33,000	29,000	− 4,000
United Kingdom ...	25,000	16,000	− 9,000
Sweden	4,000	1,000	− 3,000
Switzerland	2,000	7,000	+ 5,000
Other countries	3,000	2,000	− 1,000
Total	150,000	384,000	+ 234,000
Cables and wires for electricity, with or without insulating material of 1 cm. dia. or more.—			
United States	3,000	32,000	+ 29,000
France	26,000	58,000	+ 32,000
United Kingdom ...	93,000	147,000	+ 54,000
Other countries	1,000	—	− 1,000
Total	123,000	237,000	+ 114,000
Ditto, under 1 cm.—			
United States	48,000	21,000	− 27,000
France	18,000	18,000	—
United Kingdom ...	45,000	37,000	− 8,000
Sweden	10,000	7,000	− 3,000
Total	121,000	83,000	− 38,000
Telegraph and telephone apparatus, electric meters and parts.—			
Belgium	—	1,000	+ 1,000
United States	1,100,000	1,094,000	− 6,000
France	933,000	376,000	− 557,000
United Kingdom ...	1,033,000	724,000	− 309,000
Italy	19,000	20,000	+ 1,000
Sweden	1,351,000	933,000	− 418,000
Switzerland	129,000	232,000	+ 103,000
Other countries	120,000	2,000	− 118,000
Total	4,685,000	3,382,000	−1,303,000
Electrodes.—			
United States	59,000	54,000	− 5,000
United Kingdom ...	20,000	—	− 20,000
Other countries	—	1,000	+ 1,000
Total	79,000	55,000	− 24,000

	1916 Pesetas	1917 Pesetas	Inc. or dec. Pesetas
Hydraulic motors.—			
United States	29,000	35,000	+ 6,000
France	92,000	30,000	− 62,000
United Kingdom ...	7,000	17,000	+ 10,000
Switzerland	991,000	635,000	− 356,000
Other countries	1,000	—	− 1,000
Total	1,120,000	717,000	− 403,000
Steam and gas engines (stationary) up to 10,000 kg. weight.—			
United States	5,000	5,000	—
France	63,000	10,000	− 53,000
United Kingdom ...	401,000	210,000	− 191,000
Italy	17,000	89,000	+ 72,000
Switzerland	112,000	20,000	− 92,000
Other countries	9,000	—	− 9,000
Total	607,000	334,000	− 273,000
Ditto, from 1,0001 to 25,000 kg.—			
France	—	16,000	+ 16,000
United Kingdom ...	159,000	58,000	− 101,000
Switzerland	19,000	22,000	+ 3,000
Total	178,000	96,000	− 82,000
Ditto, over 25,000 kg.—			
United Kingdom ...	—	64,000	+ 64,000
Switzerland	360,000	49,000	− 311,000
Total	360,000	113,000	− 247,000
Cylindrical steam boilers.—			
United States	5,000	9,000	+ 4,000
France	18,000	1,000	− 17,000
United Kingdom ...	36,000	11,000	− 25,000
Switzerland	65,000	15,000	− 50,000
Other countries	3,000	1,000	− 2,000
Total	127,000	37,000	− 90,000
Multitubular boilers.—			
United States	1,000	1,000	—
France	271,000	85,000	− 186,000
United Kingdom ...	1,870,000	962,000	− 908,000
Italy	14,000	20,000	+ 6,000
Switzerland	192,000	35,000	− 157,000
Other countries	7,000	—	− 7,000
Total	2,355,000	1,103,000	−1,252,000

REPORT ON THE ELECTRIC LAMP INDUSTRY.

On March 16th the Board of Trade issued a report embodying the findings of a sub-committee appointed by the Standing Committee on Trusts which had been adopted by the Standing Committee. The members of the sub-committee were: Messrs. John Hilton (chairman), J. E. Baker, M.B.E., F. J. Blakemore, F.G.I., M. V. Loveaux, R. S. Pengelly, and W. H. Watkins.

The terms of reference were as follows:—

To inquire into the existence of any trust or trade combination in the electric lamp industry, and into the effects which the existence of such a trade combination, if proved, is having upon prices of electric lamps.

The report is an extremely interesting document, of considerable importance to the electrical industry, and we commence reprinting it below; but as it is too long to be completed in one issue, we give first the conclusions at which the sub-committee unanimously arrived:—

Conclusions.

(*a*) There is in the electric lamp industry a trade combination—the Electric Lamp Manufacturers' Association—which includes from 90 per cent. to 95 per cent. of the industry, controls factors and retailers, fixes prices at all stages, and regulates output.

(*b*) The prices fixed by the Electric Lamp Manufacturers' Association become the standard prices for all lamps sold in this country, whether made by Association or non-Association manufacturers, or imported from abroad.

(*c*) British lamp manufacturers outside the Association produce and sell to the trade (presumably at a profit) lamps of comparable quality at a lower price than Association firms.

(*d*) Because of the standard price policy originated by the Association, non-Association lamps are sold to the public at the same price as Association lamps, the advantage on the lower-priced lamps going wholly to distributors. Hence, either Association manufacturers are making an undue profit, or they manufacture less economically than non-Association makers.

(*e*) The trading discounts received by factors and retailers are considerably higher than is necessary, and should be reduced.

(*f*) Standard vacuum lamps now sold to the public at 3s. could be sold at 2s., at which price the manufacturer and the distributor would still have a satisfactory working profit.

(*g*) One and a quarter million half-watt lamps sold to the public in 1919 at 12s. 6d. were purchased in Holland by the three associated manufacturers at about 3s. per lamp.

(*h*) These half-watt lamps could have been sold to the public at not more than 8s., which price would still have left ample margins for the importers and distributors. Importers and distributors between them made profits on these lamps of something like £280,000 over and above what would appear to us reasonable.

(*i*) The Electric Lamp Manufacturers' Association has been created primarily in the interests of three firms—The British Thomson-Houston Co., The General Electric Co., and Messrs. Siemens Bros. These impose onerous conditions upon other firms in the Association, *e.g.*, a limitation of output upon licensees, and a stipulation that the validity of their patents shall not be questioned or disputed.

(*j*) The limitation of output imposed upon licensees is contrary to the best interests of the industry, and of the consumer.

(*k*) Since the largest of the three dominant firms in the Association is under majority control of an American electrical concern, there is some danger of the interests of the British lamp industry being subordinated to American interests.

(*l*) There is a possibility of an international combination, comprising British, Dutch, and American manufacturers, which would be able to control supplies and dominate prices over a considerable part of the world.

(*m*) The operations of an association which so effectively controls an important industry should be subjected to public

supervision and control; and we consider this would best be attained by giving statutory effect to the recommendations of the Committee on Trusts appointed by the Minister of Reconstruction—which, in brief, are that there should be established a department of State charged with the duty of informing itself as to the nature, extent, and development of combinations of all kinds in so far as they tend to the restraint of trade and the creation of monopolies, and of making preliminary inquiry into complaints made with regard to them; and that a tribunal should be set up to which the department could apply for powers to obtain particular information, and would refer for full investigation cases in which combinations appeared to act injuriously to the public interest.

The Committee wish to record their great appreciation of the services rendered by the secretary, Mr. P. Gent, in connection with this inquiry.

REPORT.

To the Chairman of the Standing Committee on Trusts.

1. We were appointed to inquire into the existence of any trust or trade combination in the electric lamp industry, and into the effects which the existence of such a trade combination, if proved, is having upon prices of electric lamps.

We have held nine meetings, and have examined representatives of the Electric Lamp Manufacturers' Association of Great Britain, Ltd., of electric lamp manufacturers inside and outside the Association, as well as factors and distributors of Association and non-Association lamps.

2. Since in our inquiry we have had to investigate the influence of trade combination upon the development of the electric lamp industry in this country, and to relate that influence to questions of patent rights, exclusive processes, and agreements of an international character, we think it well to recount briefly the history of electric lamp manufacture in so far as it bears upon our investigations.

The first incandescent lamp—the carbon filament lamp—was invented simultaneously in 1878 by Swan in England and Edison in America. Although the patents were declared invalid in every other European country, they were upheld in the United Kingdom, and the manufacture of electric lamps in this country thus became, for several years, the monopoly of one company. On the expiry of the Edison and Swan patents other British factories sprang up, and a period of expansion in the British lamp industry followed. Meanwhile German manufacturers, having been free from patent restrictions, had progressed even more rapidly, not only in volume of output but also in technique of manufacture and trade organisation; and on the lapse of the British patents they were able to send lamps into this country at a price with which British manufacturers had difficulty in competing.

For about 28 years the incandescent electric lamp in common use remained practically unchanged, and it was not until 1906 that an Austrian and a German firm produced independently the squirted tungsten filament, based on what appeared to be the same chemical principle, but different processes. The Austrian patent seemed the fundamental one, but the German process was better adapted to commercial manufacture. In 1907 a British firm, The General Electric Co., Ltd., approached both Austrian and German firms (which were then at law with regard to their patents) with a view to securing the patent rights of both for this country. The Germans were reluctant to sell, it being their intention not to license manufacturers in other countries, but to manufacture exclusively in Germany and to build up a large export trade. The Austraian syndicate, on the other hand, did not intend to manufacture, and were willing to dispose of the patent. The General Electric Co., Ltd., was eventually successful in acquiring the rights of the British patents for both processes, and forthwith erected a factory for the production of metal filament lamps in this country.

The next notable developments in the electric incandescent lamp were the production in the United States (by the General Electric Co., of New York) of the drawn tungsten wire filament lamp in 1909, and of the gas-filled lamp, popularly known as the half-watt lamp, in 1913. The British rights for these patents were acquired by the British Thomson-Houston Co., under their arrangements with the General Electric Co. (of New York), which has a majority interest in the British Thomson-Houston Co.

The gas-filled lamp, as invented in 1913, could be made only in the larger sizes, but in 1914 it was discovered that commercial lamps of lower sizes could be made if filled with argon instead of nitrogen. Up to that time, however, argon had had no commercial value, and its manufacture had not been developed. Repeated attempts to produce the gas on a commercial scale were made in this country during the early part of the war, but without success. Meanwhile a Dutch firm of repute, Messrs. Philips, of Eindhoven, had discovered a process, and were manufacturing argon-filled lamps in large quantities. Overtures were made to them by British manufacturers for the supply of the essential parts of an argon plant. The Dutch manufacturers were naturally not anxious to supply their British competitors with this machinery, but ultimately a contract, approved by the Board of Trade, was entered into, providing for the supply of an argon plant in consideration, *inter alia*, of the purchase of a large number of argon-filled lamps from the Dutch firm. After unforeseen delays the plant was received and erected at the lamp works of the General Electric Co., at Hammersmith, where it is now at work.

Prior to the war the annual output of incandescent electric lamps in this country is estimated to have been about 25,000,000, the corresponding figure for the United States being 110,000,000, for Germany 100,000,000, and for Holland 16,000,000. During the war the American output is stated to have increased by 60 per cent., and the British output by 20 per cent., while the manufacturers of Holland have gone rapidly ahead and acquired a considerable part of the foreign lamp trade of both Britain and Germany.

In 1913 electric incandescent lamps to the number of 3,300,000, having a value of £196,000, were imported into this country, while 3,700,000 lamps, valued at £192,000 were exported. During the war imports have on the average shown an increase and exports a decline. In 1919 the lamps imported totalled over 2,500,000, and those exported over 2,800,000, the f.o.b. value of the exported lamps being, however, only about two-thirds the c.i.f. value of the imports.

The consumption of lamps in the United Kingdom is now estimated at 30,000,000 per annum.

3. Under our terms of reference we are to inquire into the existence of any trust or trade combination in the electric lamp industry. We find that a trade combination does exist among electric lamp manufacturers in this country, and exercises a powerful influence over the conduct and development of the industry. The facts relevant to our inquiry concerning this combination we find to be as follows:—

The Tungsten Lamp Association was formed about seven years ago, its declared objects being to promote and protect the interests of manufacturers of, and dealers in, electric lamps in the United Kingdom; to conduct and assist in making experiments and research for the improvement of electric lamps, and to enter into agreements with members and wholesale and retail dealers relating to the manufacture, supply, and sale of electric lamps.

It has been explained to us that the success of the first metal-filament lamps, made in this country under acquired German and Austrian patents as already mentioned, encouraged other electrical concerns to make researches and take out patents for new inventions. It was considered that some of these patents overlapped, and costly litigation was threatened. Deeming co-operation preferable to conflict, The British Thomson-Houston Co., The General Electric Co., and, later, Messrs. Siemens, came together, primarily on patents, each agreeing to recognise the others' patents and to license the others for its own patents, and to interchange factory and laboratory experience. As a natural consequence, we are informed, a selling arrangement was entered into. These three, with the Ediswan Electric Co., formed themselves into the Tungsten Lamp Association. The Tungsten Lamp Association was incorporated in the Electric Lamp Manufacturers' Association of Great Britain, Ltd., in April, 1919, the declared objects of the latter association being the same as those of the original association. Various other firms have joined the Association at different times since its formation, and the complete membership is now as follows, the last three firms having joined during the war:—

The British Thomson-Houston Co., Ltd.
The General Electric Co., Ltd.
Siemens Bros., Ltd.
Ediswan Electric Co., Ltd.
Foster Engineering Co.
Stearn Electric Lamp Co., Ltd.
"Z" Electric Lamp Manufacturing Co.
British Westinghouse Electric & Manufacturing Co., Ltd. (now Metropolitan-Vickers Electrical Co., Ltd.).
Dick, Kerr & Co., Ltd. (Britannia Lamp & Accessories Co., Ltd.).
Pope's Electric Lamp Co., Ltd.

The electric lamp industry in this country may thus be regarded for our purpose as falling into two main divisions, namely, the firms in the Association and non-associated firms. The associated manufacturers of electric lamps in this country comprise the ten firms named above. The non-associated firms include:—

Cryselco Lamp Co., Ltd.
Crowther & Osborn, Ltd. (Sceando Lamp Co.).
Imperial United Lamp Co., Ltd.
Corona Lamp Works, Ltd.
Harlesden Lamp Co. (Stella Lamp Co.).
Maxim Lamp Works, Ltd.
Notable Lamp Co., Ltd.

Prior to the war the Association was responsible for about 85 per cent. of the total British output, whilst for last year its proportion is estimated to have been between 90 and 95 per cent.

4. Under our terms of reference we have further to inquire into the effects which the existence of a trade combination in the electric lamp industry, if proved, is having upon the prices of electric lamps.

The first fact to be recorded in this connection is that the Electric Lamp Manufacturers' Association has an arrangement whereby its members fix a common retail price for the various types and grades of lamps sold to the public, and give an agreed rate of discount to the factors and retailers who handle the lamps.

The nature of this arrangement is as follows: A basic discount of 20 per cent. on retail selling prices is allowed to any approved trade retailer. The Association has further a sliding scale whereby any trader doing business in Association lamps to the amount of £70 or more per annum can receive a discount proportionate to his total annual purchases of lamps from all the associated firms, the rates being as follows:—

22 per cent. on £70	net value of purchases.
24 per cent. on £130	,,
25 per cent. on £330	,,
26 per cent. on £650	,,
27 per cent. on £1,000	,,
28 per cent. on £1,250	,,
30 per cent. on £1,550	,,
32 per cent. on £1,850	,,
34 per cent. on £3,000	,,
36 per cent. on £5,000	,,
37 per cent. on £11,500	,,
38 per cent. on £28,000	,,
39 per cent. on £55,000	,,

If a trader desires and is entitled to more than 20 per cent. discount under the above scale, he must apply to the Association for grading, which is granted conditional on his signing an agreement. If the trader's net purchases entitle him to a discount of from 22 per cent. to 28 per cent., he must sign the retailer's agreement, the main feature of which is that he agrees not to advertise, stock, or solicit orders for, lamps of other than Association makes. If the trader's net purchases entitle him to a discount of 30 per cent. or more, he must sign the factor's agreement, the main feature of which is that he agrees not to advertise, stock, solicit orders for, *or sell* lamps other than Association makes. Thus, the retailer under his agreement may sell non-Association lamps only if requested to do so, and must then obtain them specially for his customer. But the factor must not on any account sell non-Association lamps. Such factors are, in practice, agents for the associated firms, and it has been stated that their number is about 50.

The Association has a system whereby the whole of the manufacturers and factors are periodically informed of the discount grading of customers, besides which they have a register of approved 20 per cent. traders. It is a rule of the Association, and a stipulation in the factor's and retailer's agreements, that no trader shall be supplied at other than the discount advertised by the Association. In no case may a manufacturer or factor give more than 20 per cent. discount to any firm without the sanction of the Association.

A condition of sale of all Association lamps is that they shall be sold to the user at the prices fixed by the Association, and all distributors are compelled to insert the price maintenance clause as a condition of sale, as well as to withhold supplies from any purchaser infringing the sales terms of the Association.

Should a factor handle any other than Association lamps, or resell at discounts other than those prescribed by the Association, supplies may be withheld, and he may be put upon the "list prices net" register. Should a retailer on preferential discount stock, advertise, or solicit orders for other than Association lamps he may be down-graded to the basic discount of 20 per cent., or put upon the "list prices net" register. Should either sell to the using public at a price other than the price fixed by the Association, he may be put upon the "list prices net" register of firms who must not be given any discount whatever by any Association manufacturer or factor. Upon the "list prices net" register are placed not only firms who have sold at less than fixed prices, but also all agents for non-Association lamps, all non-Association lamp manufacturers, and various firms who are considered not to be *bona-fide* retailers, *e.g.*, firms who claim to be retailers in order to get lamps at trade discount for their own use. This "list prices net" register, which appears to be known in the trade as the "black list," contains the names of about 100 firms.

It will be seen that the prices of electric lamps to the public are completely controlled by the Association as regards between 90 per cent. and 95 per cent. of the home supply. We have now to state that a manufacturer of electric lamps who is not a member of the Association has the normal channels of the distributing trade in large part closed to him. A new firm of lamp manufacturers starting up in business and declining to join, or being refused admission to, the Association, would have to depend for the bulk of its sales on large consumers, such as Government departments, municipalities, stores, factories, theatres, hotels, collieries, or railway companies. If such a firm wished to sell to the general public it would have to rely, almost entirely upon factors dealing only in non-Association lamps, or upon very small retailers, each of whose total purchases of lamps amount to less than £70 per annum.

The position of the non-Association manufacturer is likely to be even more difficult in the future than hitherto, by reason of the introduction of the half-watt lamp. No agent likes to admit to his customers, that he cannot supply the "latest pattern" in any line of goods, but since the half-watt lamp is at present controlled under Association patents, any retailer who becomes an agent for a non-Association lamp cannot procure a half-watt lamp except at "list prices net," and if he is a retailer in a fairly large way of business, he cannot get the preferential discounts on the half-watt and other Association lamps unless he binds himself not to stock, advertise, or solicit orders for, any non-Association lamp. This is no more than a particular instance of a general principle. The lamps made by the leading Association manufacturers are widely advertised, and every substantial retailer must be called upon, by a large proportion of his customers, to supply such lamps, but as soon as his turnover in Association lamps reaches £70 per annum he has a strong cash inducement to give the cold shoulder to any lamp made by a non-Association firm. As regards the sale of lamps to the general public, the Association, for good or for ill, can exclude the non-Association manufacturer from all but the fringes of the distributing trade.

(To be continued.)

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The "Easy-Fix" Conduit Fittings.

Every device by which the cost of installing electric wiring can be reduced is of value to the industry, and in this respect the conduit fittings introduced by the "Easy-Fix" Fittings Co., of 66, Victoria Street, S.W.1, offer distinct advantages. They are designed for use with switches, ceiling roses, and wall sockets, and dispense with wood blocks and their accompanying disadvantages, such as the necessity of cutting them to suit requirements, the loop of unprotected wire behind the block—where it may be in contact with a damp wall—

Fig. 1.—Through Outlet Box.

Fig. 2.—Ceiling Rose (Base).

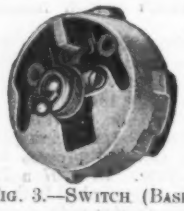

Fig. 3.—Switch (Base).

Fig. 4.—Switch Mounted.

Fig. 5.—Universal Outlet Box.

the difficulty of ensuring the earthing of the switch cover, &c. The attachment of accessories to conduit fittings by screws also gives rise to trouble, and offers scope for slovenly work. In the "Easy-Fix" system, as the name implies, all these difficulties are obviated. Fig. 1 shows a through outlet box, which, it will be seen, is provided with three internal lugs, which engage in slots formed on the wings of the special ceiling rose, fig. 2, or switch, fig. 3; the latter is securely fixed in place by screwing on the cover, which in the case of the switch is of metal, and thus earths the exposed metal parts to the conduit, without the use of a special earthing screw. Fig. 4 is a "ghost" view of the complete switch in place, showing the method of locking it to the box. Fig. 5 shows a "universal" type of outlet box; and other patterns are made, but only about half a dozen are required to cover all requirements. The ceiling roses and wall sockets are made in accordance with the British Engineering Standards Association's specification, and all the fittings are standardised as far as possible, the same boxes serving for roses, brackets, rigid pendants, switches, &c. They can be used with any wiring system, suitable devices being provided for the purpose where necessary, such as an earthing clamp inside the box for metal-sheathed wire. Those illustrated are castings,

but a line of boxes is in preparation of pressed steel, embodying the same features, and covered with a white enamelled fibre ring which gives them a very neat apearance. By the use of the "Easy-Fix" system, it is claimed, a material economy is effected on the cost of every outlet.

A "Mazdalux" Ceiling Unit.

The British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames Street, E.C.4, has recently introduced a very compact ceiling unit (fig. 6). This consists of a metal

Fig. 6.—"Mazdalux" Ceiling Unit.

reflector, lampholder and housing suitable for direct attachment to a ceiling. The upper part is cut away, as shown, to permit the entry of casing, conduit or wires.

The "Hoadley" Current Limiter.

Messrs. Drake & Gorham Wholesale, Ltd., 67, Long Acre, W.C.2, have sent us particulars of a current limiting device, which, although not new, has been greatly improved upon and re-designed. The main feature of the "Hoadley" limiter (fig. 7) is a coil (A), taking the main current, one end of which is connected to the circuit through terminal B, and the

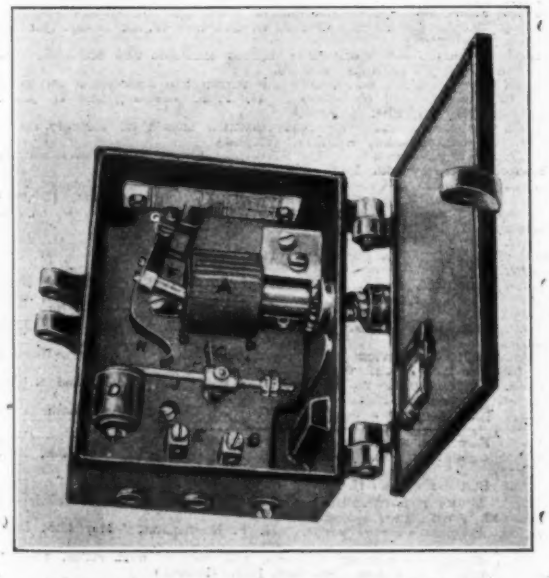

Fig. 7.—The "Hoadley" Current Limiter.

other end is connected through a tripping arrangement C and a mercury switch D to terminal E. Entering the coil is an armature F pivoted at G and bearing a striking piece H. When the current through the coil exceeds a predetermined limit the armature is drawn into the coil, and the striking piece trips the switch C which, being rigidly fixed, raises the bar J, breaking the circuit at the mercury cup. The armature is immediately released, but if the current is still excessive the circuit is again broken, and this action goes on until a lamp or lamps are switched off and the current is reduced.

A New British Motor.—The sole British agent for the motors described in the Electrical Review of March 19th under the above heading is the Enterprise Manufacturing Co., Ltd., Gun Street Electrical Works, Bishopsgate, E.1.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Cost of Living in India.

It might interest those thinking of accepting a post in India to know something about the present cost of living from a woman who has spent some years out here. As to the value of the rupee, in spite of the favourable rate of exchange, viz.. 2s. 9d. to 2s. 11d., the purchasing power of the rupee is actually down fifty per cent., taken all round.

In pre-war days a young single assistant engineer in an up-country station might reasonably expect to start on from Rs. 350 to Rs. 450 per mensem, with the usual free quarters, medical attendance, passage out and home, and six months' leave on full pay at the end of, say, five years' service.

In the present state of affairs, and possibly for many years to come, the above conditions would be quite inadequate if a young man hoped to put by a little for his efforts. In towns, housing and even hotel accommodation is very difficult to procure, the former running from Rs. 80 to Rs. 110 per month for flats, Rs. 150 and over for houses, and the latter from Rs. 175 to Rs. 225 per month for a single room.

To run your own small establishment on the most economical grounds, servants' wages alone cost approximately Rs. 100 per month; even in an hotel you would have to keep a boy and pay him Rs. 30 per month, besides various other tips, probably running to another Rs. 30, if you wished to get any attention.

The married man is at a still greater disadvantage, for a conveyance is an absolute necessity. A carriage, horse, and groom can be hired in towns for Rs. 120 per month; previously the price was Rs. 60.

If there is a child an ayah is a necessity—a further cost of Rs. 30.

If two shared a flat, or three or four formed a chummery, the messing bills would run to approximately Rs. 150 per head. Clothing is another serious problem, a drill suit costing from Rs. 20 to Rs. 30, and these are required in numbers, as the "dhobi" takes care they do not last you too long. A lounge suit costs Rs. 80 to Rs. 120. English boots are Rs. 35 per pair; country boots are not worth the purchase.

I think I have given sufficient general details above, which do not include gymkhana and club subscriptions, &c., and would summarise the minimum starting salaries as follows:—

(*a*) A single young mechanic, Rs. 450 per month.
(*b*) An assistant engineer (unmarried), Rs. 750 per month.
(*c*) No responsible position should be accepted under Rs. 1,000 per month.

It is understood that the usual free allowances will be given as stated previously; this is really a most essential clause in all agreements. An ordinary "box walla," or merchant's assistant in a merchant's office, will draw his Rs. 1,000 per month, plus allowances, and think himself badly off.

Western India.

February 25th, 1920.

[We are very much indebted to our correspondent for this excellent statement of living conditions in India.—Eds. Elec. Rev.]

Automatic Switching for Street Lamps.

It would be interesting to know if automatic clock switches have been found satisfactory for operating street lamps. These switches are now being developed to a considerable extent for working gas lamps, which leads to great economies, as lamplighters are not required and also because the lamps can be lighted and shut off at the correct times, whereas with lamplighters they must be put on long before dark and shut off after daylight to allow for the time that the lamplighter uses in going round.

Clock switches did not get a good name for electric lighting purposes in days gone by, but one would like to know if there have been improvements since.

C. Turnbull.

Electricity Works, North Shields.
March 19th, 1920.

Wages in Kinemas and in the Electrical Industry.

In an article of mine, "Electricity and Kinematography," which you published in your issue of Sept. 5th, 1919, I briefly dealt with the status of the kinema operator. It is interesting to note that his position has now become more definite and recognised, and that he has attained unto a wage which would bring joy to many a hard-working shift engineer or technologist. Electricity, as I pointed out in the article, plays an important part in picture projection, and it is insisted (and rightly) that a chief operator must have had at least two years' experience.

But even two years in an operating-box can hardly be taken as a thorough claim to electrical competence, though it certainly gives plenty of time for an operator to get "the hang" of his equipment—and practice, it is said, makes perfect. As

I have pointed out elsewhere, we have in kinematography an outstanding example of co-operating electrical appliances and methods which function so well as to require little or no skilled attention. Still, in view of the nature of projection work, it is necessary to ensure at least a modicum of technical skill on the part of the operator.

Not very long ago a kinema operator was lauded in the Press because he was said to have saved the situation, and innumerable lives, when a fire occurred in the operating-box. The plain fact of the matter was that no fire should have taken place at all; with a skilled (or should I say experienced) operator-electrician, the risk of a fire outbreak is so remote as to be negligible.

I call to mind the chief operator of a kinema in a Midland town who proudly demonstrated his knowledge of Ohm's Law ("Ho-hem's Lorr," as he termed it!). "Now," he explained, "with one amp. and one volt you get a resistance of one ohm. You can't deny that. In my 'box' the juice is 70 amps. at 70 volts, so that, by my reckoning, gives a resistance of 70 ohms." A logical and plausible argument.

This man was considered a good chief operator, and he is but one of many who, knowing little or nothing of the theoretical side of their electrical work, yet manage to "carry on" quite well in practice (thanks to efficient and safe electrical design). Now this raises an important issue: If, with a superficial technical knowledge and a job which does not demand skill of a high order, a kinema operator can claim the respectable wage of £5 per week, isn't it time the electrical industry woke up to the fact that many of its highly-skilled workers are receiving shamefully low pay in comparison? Of course, the kinema operator has realised the deadly power of *combination*. Yet his work, after all, is only for entertainment purposes (admittedly useful), while the electrical industry is playing a most important and ever broadening part in the *productive* life of the community. *Verbum sap.*

G. E. Moore.

London, N., *March 22nd*, 1920.

NEW PATENTS APPLIED FOR, 1920.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

6,939. "Electric valve or lamp relay and intervalve transformer." G. A. Mathieu. March 8th.
6,946. "Sparking plugs." F. A. L. Johnson. March 8th.
6,971. "Sparking plug." G. C. Lazenby. March 8th.
6,974. "Wireless telegraphy or telephony." O. Thornycroft. March 8th.
6,977. "Subscribers' instruments for telephone systems." E. A. Petithory and Siemens Bros. & Co. March 8th.
6,980. "Electric heaters." H. W. Sullivan. March 8th.
6,988. "Telephone transmitters." Miessner Inventions Corporation. March 8th. (United States, March 12th, 1919.)
6,990. "Sound-reproducers for talking-machines, telephones, &c." E. Paterson. March 8th.
6,998. "Electro-therapeutic plates." S. Porter. March 8th.
7,003. "Detection signals." E. E. and S. P. Marsh. March 8th.
7,004. "Thermal circuit closer." H. Fairbrother (H. Siebe). March 8th.
7,020. "Electric heater." P. J. H. Bernard. March 8th.
7,023. "Storage electric batteries." W. E. Holland and L. J. Pearson. March 8th. (United States, September 5th, 1919.)
7,024. "Storage electric batteries and separators for elements thereof." W. E. Holland and J. M. Skinner. March 8th. (United States, May 17th, 1919.)
7,038. "Electric circuit breakers, &c." J. Hall. March 8th.
7,039. "Time-lag devices." J. Hall. March 8th.
7,046. "Remagnetising device." G. A. Fosbl. March 8th. (United States, March 20th, 1918.)
7,069. "Telegraph printing systems." Automatic Telephone Manufacturing Co., H. H. Harrison and S. R. Smith. March 9th.
7,084. "Key and receiving gear for wireless telegraphy." J. Swinbourne. March 9th.
7,092. "Method of using electric lamps to illuminate heated, &c., chambers." A. W. Bridges. March 9th.
7,099. "Detachable sparking plug." L. Wells. March 9th.
7,106. "Junction box for electric wiring systems." J. C. White. March 9th.
7,109. "Device for packing and carrying Marconi bulbs." A. Astley. March 9th.
7,140. "Electric targets." P. Elphick. March 9th.
7,142. "Systems of electric ship propulsion." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 9th.
7,147. "Electric storage batteries or accumulators." G. R. N. Minchin and The Pritchett and Gold and Electrical Power Storage Co. March 9th.
7,160. "Miners' safety, &c., electric hand lamps." G. Oldham, J. Oldham, O. Oldham, and Oldham & Son. March 9th.
7,163. "Automatic switch for electric heating appliances." B. G. C. Stephens. March 9th.
7,176. "Electron-releasing devices." J. E. Lilienfeld. March 9th. (Germany, December 12th, 1919.)
7,199. "Guiding devices for trolleys of electric tramway, &c., vehicles." R. N. Bradley and A. E. Millington. March 10th.
7,210. "Electric heaters." W. Marples. March 10th.
7,224. "Cord-grips for electric lamp holders." V. Hope. March 10th.
7,235. "Magneto-electric ignition apparatus." H. G. C. Fairweather (Aktiebolaget Svenska Elektromagneter). March 10th.
7,255. "Electric-starting apparatus." H. G. Andre. March 10th.
7,256. "Thermionic tubes for wireless transmission systems." S. Brydon, A. G. T. Cusins, S. Johnson and J. H. Whittaker-Swinton. March 10th.
7,266. "Reflectors for lamps, &c." Benjamin Electric, Ltd., and G. Campbell. March 10th.
7,280. "Deflagration apparatus for testing the electrostatic rigidity of insulating materials." A. R. Matthis. March 10th.
7,286. "Telephone fittings." M. H. Spencer. March 10th.
7,342. "Electrically-operated illuminated advertising, &c., signs." A. S. Ellerton. March 11th.
7,346. "Circuit interrupters." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 11th.
7,348. "Electric switches." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 11th.
7,359. "Grill for gas and electric cooking stove." H. H. Beach. March 11th.
7,361. "Generation, transmission, or distribution of electricity." Ferranti, Ltd., W. H. Hanstock, H. Hawkins and A. H. Higgs. March 11th.
7,365. "Safety device for electric generators." Siemens-Schuckertwerke. March 11th. (Germany, October 23rd, 1918.)
7,377. "Aerials for wireless signalling." T. L. Eckersley. March 11th.
7,378. "Electrodes for electric welding." J. H. Paterson and Premier Electric Welding Co. March 11th.
7,386. "Storage battery locomotives." Mancha Storage Battery Locomotive Co. March 11th. (United States, August 31st, 1918.)
7,401. "Sparking plugs." J. E. Barrow. March 12th.
7,431. "Device for winding armature coils." J. A. Edley. March 12th.
7,452. "Electric-signalling apparatus." J. L. Major and F. S. S. Wates. March 12th.
7,454. "Electric relays." M. D. Dimitrievitch. March 12th.
7,457. "Method of carrying or storing electric-light bulbs." A. Astley. March 12th.
7,486. "Telephone receivers." M. Barrasford. March 12th.
7,490. "Electric signalling systems." F. G. Bell, W. C. Davey and Sterling Telephone & Electric Co. March 12th.
7,503. "Electric signals." P. H. Pupumjee. March 12th.
7,504. "Producing low-frequency varying current or voltage by thermionic valve circuits." W. A. Appleton, S. H. Long and A. K. Macrorie. March 12th.
7,517. "Ignition devices for internal-combustion engines, &c." D. R. Dobson and W. Pickard. March 13th.
7,523. "Switches for electric signalling systems." R. Blunt and H. F. Mitchell. March 13th.
7,542. "Switch and fuse contacts." Callender's Cable & Construction Co. and J. F. Watson. March 13th.
7,544. "Electric starting and regulating switches." C. J. Margerison and F. J. Shenton & Co. March 13th.
7,561. "Systems of electric motor control." British Thomson-Houston Co. (General Electric Co., U.S.A.). March 13th.
7,573. "Galvanometers." J. Riddle and Telegraph Construction & Maintenance Co. March 13th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1914.

11,657. Indicating arrangements for electricity supply systems. A. J. J. Marguerond and R. F. J. D. Du Rousset. May 12th, 1914.

1916.

16,862. Connection for electric leads. P. Clerget and Soc. Clerget Blin, et Cie. November 24th, 1916. (138,940.)

1919.

276. Electric switch for use with burglar alarms. G. Nissen. January 4th, 1919. (138,957.)
1,259. Arrangement for indicating or utilising vibratory movements of amplitudes insufficient to effect the opening or closing of an electric circuit or to give a visual indication. Automatic Telephone Manufacturing Co. and S. R. Smith. January 17th, 1919. (138,966.)
1,271. Electro-plating. C. A. Bolton. January 17th, 1919. (138,967.)
1,470. Signalling systems for use in mines and for similar purposes. Sterling Telephone & Electric Co., F. G. Bell and W. C. Davey. January 20th, 1919. (138,968.)
1,682. Apparatus for electrically testing magnetos and the like. A. Hewlett. January 23rd, 1919. (138,970.)
2,289. Apparatus for discovering and determining electrically the location of veins of ore or mineral. H. T. F. Lundberg and H. J. H. Nathorst. July 8th, 1918. (129,621.)
2,542. Supporting means for light-diffusing shades on electric lamps. C. H. Kitching. February 1st, 1919. (138,980.)
3,407. Electric switches. Cable Accessories Co., F. H. Reeves and A. Crawford. February 12th, 1919. (138,987.)
4,244. Automatic or semi-automatic telephone systems. Automatic Telephone Manufacturing Co. and H. M. Friendly. February 20th, 1919. (139,000.)
4,386. Electric storage batteries. London Battery Co. and E. W. Clarke. February 21st, 1919. (139,001.)
4,459. Electrical signalling systems such as are used in mines. Automatic Telephone Manufacturing Co. and H. Green. February 22nd, 1919. (139,003.)
4,460. Electrical signalling systems such as are used in mines. Automatic Telephone Manufacturing Co. and H. Green. February 22nd, 1919. (139,004.)
5,929. Electric switches. Benjamin Electric, Ltd. July 3rd, 1918. (129,254.)
6,864. Protective devices for electric circuits. British Thomson-Houston Co. (General Electric Co., U.S.A.). March 19th, 1919. (139,032.)
7,288. Electromotor. W. R. Sykes Interlocking Signal Co. and R. W. Tarrant. March 24th, 1919. (139,038.)
7,830. Quartz mercury vapour lamps. H. George. April 24th, 1918. (125,944.)
8,601. Electrical relays or contact-makers for mine signalling apparatus and for other purposes. J. R. L. Allott and E. Dean. April 5th, 1919. (139,005.)
9,205. Electric fuses. H. J. Abbott. April 11th, 1919. (139,061.)
10,230. Means for ventilating dynamo-electric machines. W. Holt and Brolt, Ltd. April 24th, 1919. (139,066.)
12,589. Electric welding tongs. H. F. Kuntzmann. May 19th, 1919 (139,078.)
13,998. Covers to electric switches, bell pushes, wall plugs, sockets and the like. J. A. Bower. June 2nd, 1919. (139,085.)
14,062. Electric heaters for ironing, cooking, heating, and like apparatus. P. P. Meunier. June 4th, 1918. (127,826.)
14,110. Electric switches. A. P. Rutherford. June 4th, 1919. (139,087.)
17,427. Electric lighters. B. L. Dechelle. July 12th, 1918. (129,653.)
18,301. Automatic or semi-automatic telephone systems. Automatic Telephone Manufacturing Co. November 4th, 1918. (134,812.)
20,116. Thermostats. W. J. Mellersh-Jackson (Cutler-Hammer Manufacturing Co.). January 21st, 1919. (Divided application on 1,571/19.) (139,111.)
23,811. Device for testing a person's steadiness of hand and accuracy of aim. Riebe-Kugellager-und Werkzeugfabrik Ges. (in liquidation). November 6th, 1918. (134,821.)
24,856. Electric plug coupling. O. Kessler and W. P. Hammond. October 10th, 1919. (139,126.)
24,927. Electrical driving means for phonographs or the like. J. Russ and F. J. Russ. September 1st, 1917. (133,715.)
29,404. Electric switches. V. E. Joyce and Park Royal Engineering Works. May 26th, 1919. (Divided application on 13,453/19.) (139,135.)
29,447. Audible and visual signals as used for mining-shaft signals and the like. W. O. Vicary. November 20th, 1919. (139,136.)
30,970. Automatic telephone systems. D. S. Hulbth. December 9th, 1917. (Divided application on 127,471.) (136,817.)